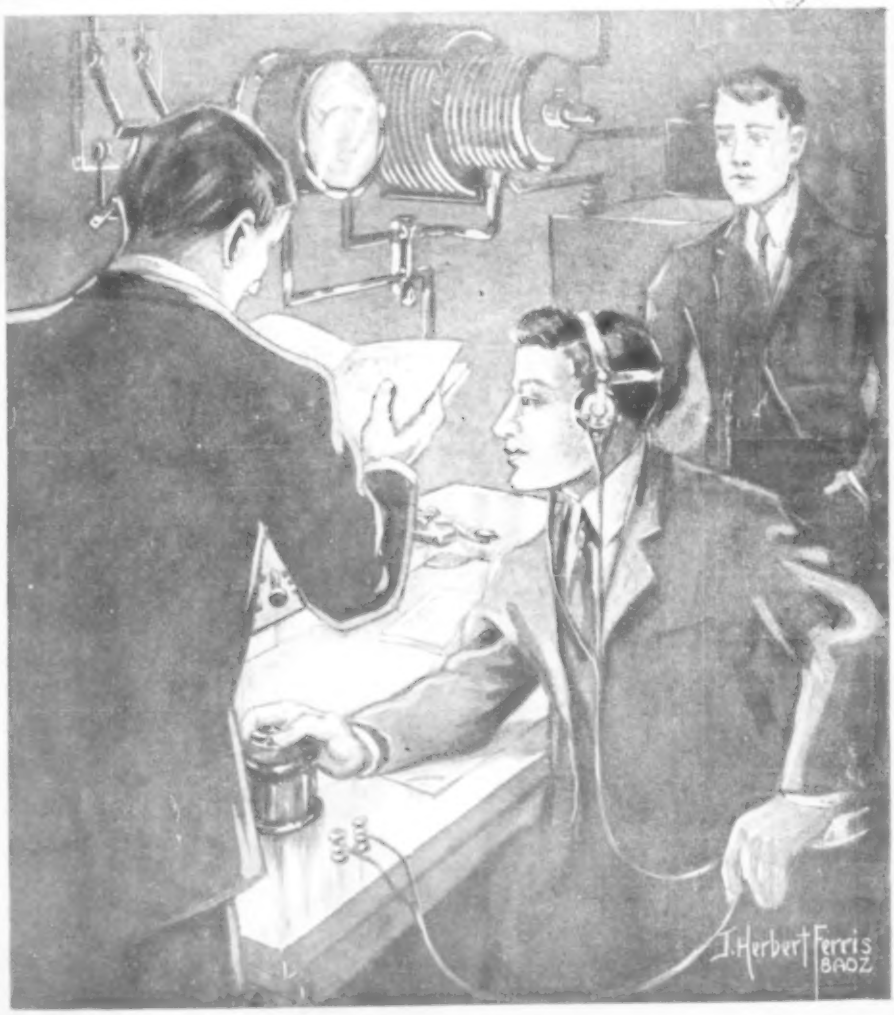
QST

A MAGAZINE DEVOTED EXCLUSIVELY TO THE WIRELESS AMATEUR

OFFICIAL ORGAN OF THE AMERICAN RADIO RELAY LEAGUE

PRICE February 1917 15 CENTS

OF CONGRESS



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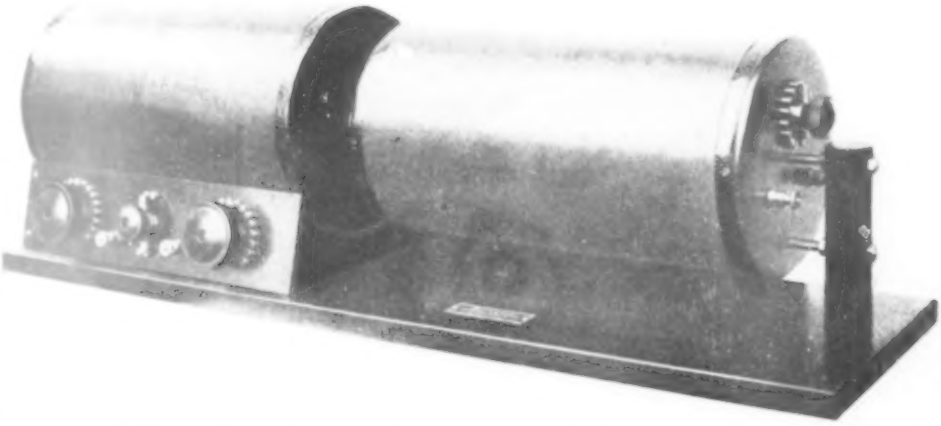

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¶ Q S T is published monthly by The QST Publishing Company, Incorporated at Hartford, Conn. Subscription price, $1.00 per year. Single copies, 10 cents. ¶ Entered as second-class matter March 7, 1916, at the Post Office at Hartford, Conn., under the act of Congress of March 3, 1879. ¶ Copyright, 1916, by the QST Publishing Co., Inc. ¶ Title registration applied for at the United States Patent Office.

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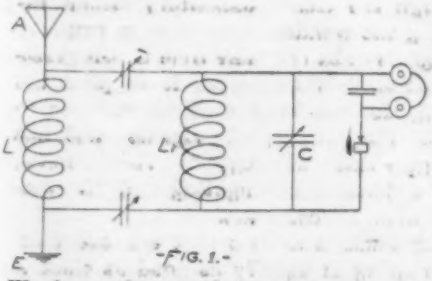
Q S T
A MAGAZINE DEVOTED EXCLUSIVELY TO THE AMATEUR

Electro-Statically Coupled Receivers

Read before the Radio Club of America,
Nov. 17 1916, Harry Sadenwater.

DURING the past year or two several Navy operators have remarked to me about the sharpness of tuning effected with a receiver in the navy known as the Cohen receiver. Some of the operators even complained that it tuned too sharp. Electrostatic or capacity coupling is employed and for a paper for the present meeting it was suggested that this form of coupling be discussed.

A diagram of the connections of the Navy type of capacity coupled receiver is given in Figure 1.



-FIG. 1.-

We have the usual tuned antenna circuit ALE and not inductively coupled to this primary circuit and generally well removed from it, we have the regular closed oscillatory circuit, L. C. The energy indicating or detecting arrangements may be connected to the closed circuit in the ordinary manner.

The parts that are new are the connections through small variable condensers between primary and secondary inductances. In assembling these two intermediate coupling condensers are mounted on a single shaft and their capacities are simultaneously varied and controlled by one single knob. The larger the capacity made use of in these coupling condensers the greater the transfer of energy of coupling between the two oscillatory circuits.

This was first explained very simply by pointing out that the charge on any condenser is proportional to its capacity and the potential to which it is charged that is $Q = VC$. Now the potential across the inductance L of the primary circuit is fixed when the circuit is tuned to any incoming signal. Therefore the energy transferred over the secondary circuit is proportional to the capacity of the coupling condensers The larger capacity employed, with the given potential across the antenna circuit inductance, the greater quantity of electricity would be handled and the greater the coupling or transfer of energy obtained.

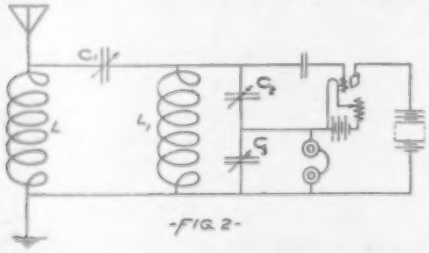
Note must be made that, though the circuit L, L completed through the two coupling condensers is oscillatory in char-

acter, it is not tuned to resonance with the receiver wave.

The principle advantage of a system of this type is the convenience had in tuning to strange wave lengths. A single turn of the coupling condenser knob adjusts the coupling to any desired value and the same coupling is held while both the primary and secondary inductances and capacities may be adjusted to wave lengths over the whole range of the receiver. After a station has been picked up the coupling can be loosened (by decreasing the capacity of the coupling condensers) to a working value and after making slight readjustments to both primary and secondary circuits, the receiver is ready for reception. Economy of space is effected since the room required for sliding the coupling coils back and forth is eliminated.

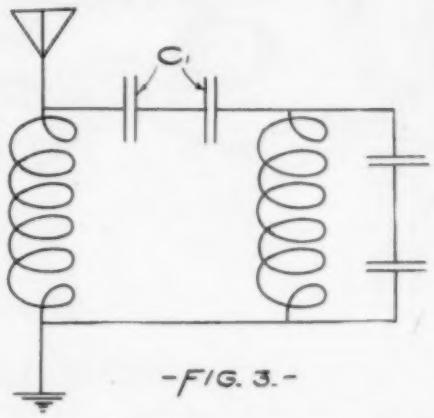
This arrangement is particularly recommended for coupling the antenna and secondary circuits of long wave receivers in that it does away with the usual big unmanageable long wave couplers, since for the same results only one or two small variable condensers are required.

Figure 2 shows an arrangement for receiving damped as well as undamped long wave signals employing the regenerative circuit with the capacity coupling.



-FIG. 2-

As set up L is a large varimeter having a maximum value of inductance of about 20 millihenries, about 5 millihenries being required to tune to Glace Bay with the particular antenna used. C_1 is a small slide plate variable condenser with a maximum capacity of approximately 0.001 microfarad but only the smallest part of this capacity was used, in fact just the ends of the sliding plates overlapped the ends of the stationary plates. It is recommended that C_1 be composed of two condensers in series, Figure three, one adjusted to a small capacity and the other variable condenser made use of in making the finer adjustments.



-FIG. 3.-

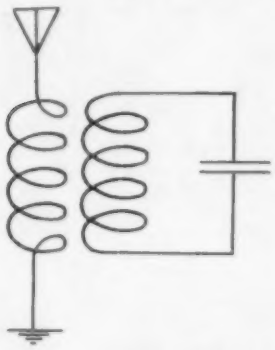
The condenser is omitted from the lower leg since it is desirable to ground the telephone while operating this type of circuit and electrically the results are identical, whether both legs are interrupted or only one.

L, the secondary closed oscillatory circuit inductance was a multilayered coil and had a maximum value of inductance of the order of 250 millihenries, though seldom more than 100 millihenries is made use of. C, is the usual secondary tuning condenser of the order of 0.001 microfarad and C3 is a variable condenser with a maximum capacity of the order of 0.01 microfarad, its purpose as is well known, being to couple the wing and grid circuits, allowing the wing currents to reflect back through the closed oscillatory circuit affecting the wonderful increase in response to signals or at the same time if still greater coupling is employed, it supplies the energy for the local oscillations so as to make the undamped signals audiable though this heterogyne. The audion, grid condenser and lighting and "B" battery need no comment.

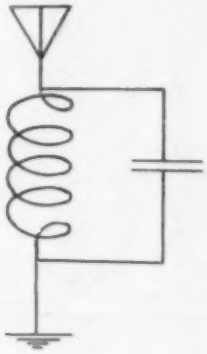
Experiments show that the above form of coupling is equally as good as electromagnetic coupling on the long wave. Good signals with neat and convenient control of coupling being obtainable in a simple compact and inexpensive manner. However while experimenting with the discussed arrangement it was noticed that the changes in coupling made necessary a de-

cided change in the closed circuit tuning and in running through the matter several points came up which may prove interesting.

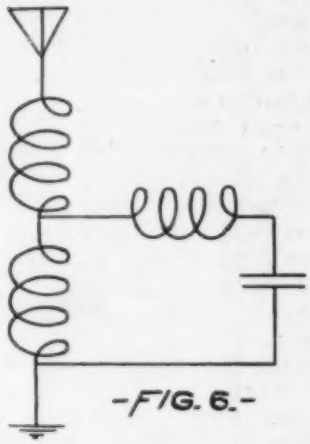
First, consider the simple Marconi inductively coupled circuit, Figure four.



-FIG. 4.-



-FIG. 5.-

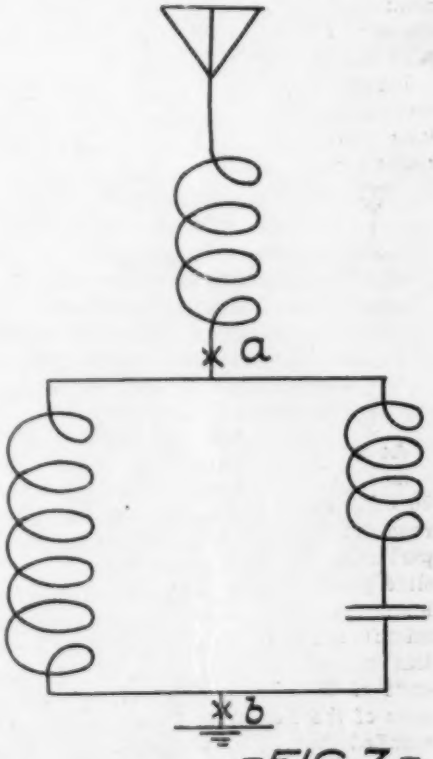


-FIG. 6.-

With unity coupling this is equivalent electrically to a circuit of the form of Figure 5. With reduced coupling we have the equivalent in figure 6. Here the antenna inductance has been divided into that part which is not in inductive relation to the secondary circuit and that part that would have unity coupling with a part of the inductance of the closed circuit, the remainder of which is not coupled to the antenna circuit.

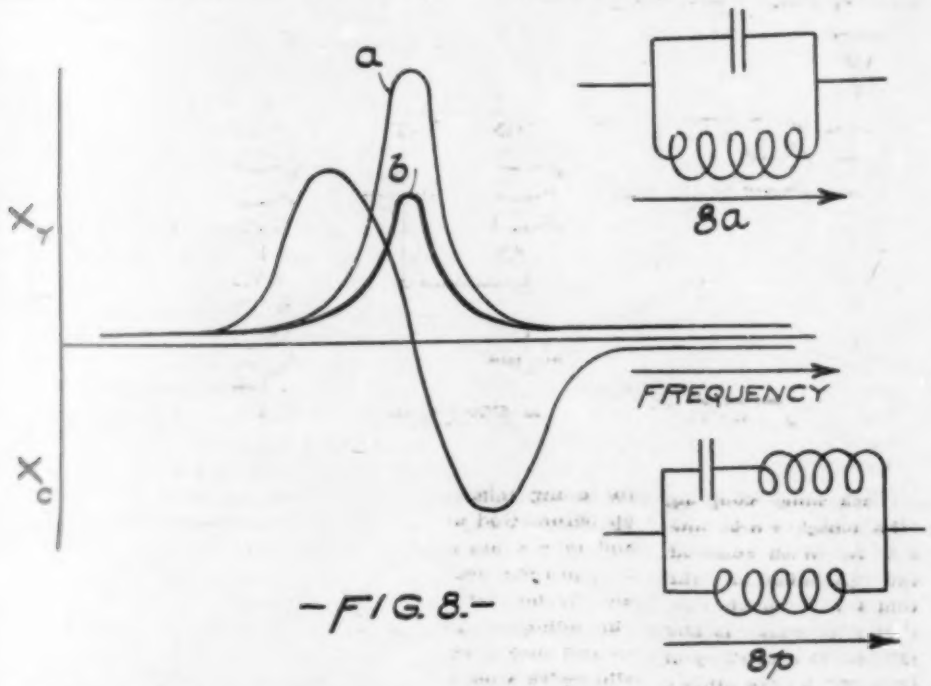
What we really have is a tuned branch circuit in the antenna circuit (Figure 7). Recalling Dr. Stone's paper of last Spring you know that when the branch circuit is in resonance with the antenna circuit the branch circuits impendance or resistance is very high. It would be infinite if the conductors themselves did not have a certain amount of resistance. However, by shifting some inductance from one leg over into the opposite capacity leg (as is the case in Figure 7) it is possible to bring the effective resistance of the branch circuit between the points a and b of Figure 7 down until the effective resistance of the branch circuit is the same as the resistance of the antenna circuit. This is the condition when most power will be available in the branch circuit for consumption in the detecting devices and the loudest signal is obtained.

This effect of decreasing the effective resistance of the branch circuit may be rendered a little clearer by referring to Figure 8. Here reactance has been plotted against frequency. Curve a roughly



-FIG. 7.-

shows the effective resistance of a circuit of the form of Figure 8, while curve B shows the effective resistance of a branch circuit of the form of Figure 8 b at the same resonant frequency.



-FIG. 8.-

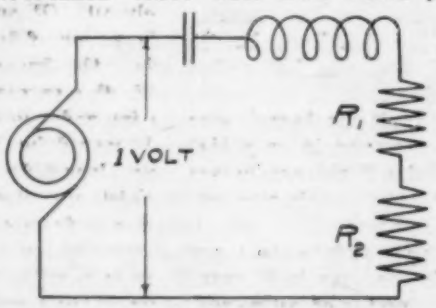
Allowing myself to still further draw away from the main subject for just a few more minutes, this matter of having the effective resistance of a coupled circuit the same resistance as the resistance of the primary or feeding circuit to obtain the highest efficiency may prove interesting. The following should clear up the fact but not the reasons therefor.

Consider a resonant circuit, Figure 9 which has a resistance R, of say ten ohms and across which a potential of one volt is applied. For a moment let R2 not be in the circuit. The current is plainly 0.1 ampere and power available.

$W = I^2 R = .01 \times 10 = .1$ watt

Now let us insert a new resistance R^2 in this circuit which is the equivalent of coupling a new circuit to it. Suppose this new resistance is ten ohms. The new current is $I = 1\text{-}20 = ER = .05$ amp. and power available in new resistance or coupled circuit. $W = I^2 R = .0025 \times 10 = .025$ watt

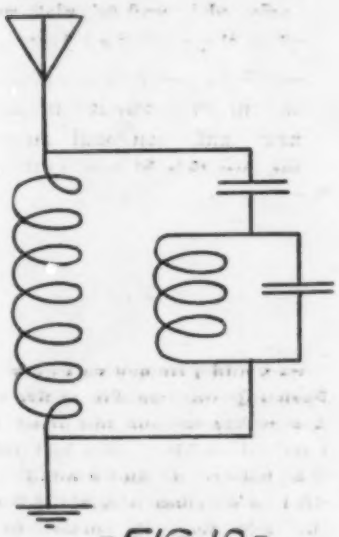
But suppose new resistance was eight ohms; then new current would be $I = ER = 1\text{-}18 = .055$ Amp and power available in new resistance or coupled circuit is $W = I^2 R = .055\ 2x8 = .0242$ watt similarly if added resistance was twelve ohms, new current $I = ER = 1\text{-}22 = .0454$ Amp and available power would be $W = I^2 R = .04542 \times 12 = .0247$ watt from which you



-FIG. 9.-

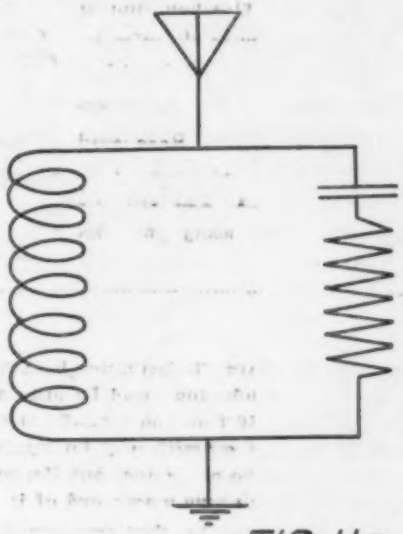
can readily see that the highest efficiency is obtained when the effective resistance of a coupled circuit is made the same as the resistance of the primary circuit. So you see that you have a good reason why

the best signal is often obtained with looser coupling. By decreasing the coupling you decrease the effective resistance to the open circuit of the closed circuit and as discussed when both resistance are equal, highest efficiency is obtained.



-FIG. 10.-

finite capacity (that is a Short circuit) and think of the effect on the resistance in series with the capacity. At zero capacity we would have an open circuit and no difference of potential would be applied across the closed oscillatory circuit of the



-FIG. 11.-

Returning to the original subject, if we consider Figure 10 an outline of the high frequency circuits used with the electrostatic coupling and compare it with Figure 7 with the electromagnetic coupling—they look similar but are quite different. In Figure 10 we have a branch circuit in a branch circuit in the antenna circuit. However, only the secondary branch or parallel circuit is approximately tuned to the frequency impressed on the antenna. The large branch circuit L, C, (L_2 C_2) is not tuned to the frequency being received, when using a working coupling.

But the branch circuit L_2 C_2 when in reasonance with the impressed omf of the antenna circuit would have a very high resistance. Therefore with L_2 C_2 in resonance the circuit of Figure 10 is equivalent electrically to a circuit of the form of Figure 11. The branch circuit of Figure 11 is not oscillatory or very feebly so and at a frequency very different from the frequency of the received wave.

Now suppose that the capacity of Figure 11 can be varied from zero to infinite capacity (short circuit) we would have our old friend a tuned branch circuit directly in the antenna circuit with too great a coupling. So between these two extremes there is a degree of coupling that would allow the closed secondary circuit to introduce a resistance equal to the antenna resistance into the antenna circuit and at that adjustment would receive the maximum of energy, giving you the loudest signal.

receiver and no transfer of poser would result. And with infinite capacity (short

In conclusion, I wish to thank Mr. E. H. Armstrong for his great help in preparing this paper.

*****

GREELY RADIO CLUB

The amateurs of Greeley, Colorado, formed the Greeley Radio Club to promote radio interest. The officers are Pres., Karl Foulk; Vice-Pres., Eastman jacobs; Sec. Treas., George Bardwell.

Amateur Number One

By Irving Vermilya

Amateur Number One is a snappy, up-to-the-minute, humorous story of the original father of the American amateurs. Generations have come since, but still Mr. Vermilya is an amateur at heart. The story of his

early trials and tribulations when there were no brother amateurs starts in this issue. It will be continued in the next and you will enjoy reading this history with a laugh to every spark.—Editor.

NOW Boys, I don't want to make too much noise, and I want you to holler if I go too far—I am going to start off with a claim that's going to be a big one, but I'm pretty sure I can back every very word of it.

Here it is: I was the first amateur in this country to get an aerial up and investigate into the mysteries of wireless. No doubt, were I at a meeting, there would be an awful wail about now to "sit down". But fellows, listen, I am only sorry I have no record of the date when I first got the Wireless Bug, but I am going to look it up. I believe I know at least one gentleman who can throw some light on it, if I can only find his present whereabouts.

Along about the time when Marconi was first doing a little experimenting—long before there was any United Wireless Company, or any DeForest Company, or in fact, any amateurs, or manufacturers of wireless goods—I became interested in reading about what Marconi was doing with a kite and string some where along this Coast. Of course I became interested, but could not imagine how he was doing it. I can remember seeing the big head lines about Marconi, and I said right then and there, "Me for this wireless. That's the stuff".

Now it so happened that I was quite a good boy, so I asked the minister of our church to help me get acquainted with Marconi. Of course, he smiled at me and tried to calm my wild desires much as a kind mother would do for her little boy who cried for the moon. But I was not to be downed so easily. I had an awful bull-dog grip on this wireless stuff,and I would not let go. Probably six months or so elapsed. I could not seem to get any nearer to Marconi, until one day, Dr. Tyndal, the kind-hearted minister, brought me the glad news that he had succeeded in seeing the wonderful wizard Marconi, and that he had given the minister a Marconi cohera and tapper. Well! when I got my hands on these —fellows—you can believe me, the world wasn't large enough to hold me. I wish you could have seen me paw over the old blue prints and dope on the "how and why," which Marconi had also sent. I went to my father and said "Dad, I've got to have some money. I'm going to build a wireless." Well, Dad laughed of course, but he handed me out the first batch rather easily, and I made for New York City.

After a ride on "air" for fourteen miles from Mt. Vernon to New York City I arrived at the Grand Central. I finally landed up at J. H. Bunnell & Co., who had plenty of telegraphs, but—no wireless. I told the clerk I wanted a polarized relay, and some wire for use in "Wireless Telegraphy". The clerk just stood as though he had become suddenly petrified—mouth open—

eyes wild. Of course it was too early to have asked "What der yer mean, wireless telegraphy", as that expression "What der yer mean" wasn't born then. He finally

"I want a polorized relay and some wire for use in "Wireless Telegraphy."

did get up steam enough to get the relay and some insulated wire. Just imagine. I bought 150 feet of insulated bell wire, which was to be my complete aerial lead, and all. Say fellows, can you imagine going into Bunnell's at this time and have no one know what a transformer was, nor aerial wires, helixes— Just think, never been heard of. It does seem so queer now to look back.

The next day saw me up and out of bed bright and early. It was a great day, and I was eager to get the aerial up.—Bet there'll be an uproar when this is read.— My aerial was only twelve feet long—light wires. I made an arrangement out of furring strips in the shape of a cross. The main pole was twelve feet long, with a cross piece nailed to the top and bottom. Between the top cross piece, which was about four feet across, and the bottom one, I stretched light wires, and with double pointed tacks, and no insulators, nailed them to the cross.

That night I studied late over Marconi's old blue prints, and the dope. By the way, he didn't say anything about insulators or length of aerial, so how should I know ? In the course of a few days, I had it all hooked up, and was waiting for it to work, although who I expected was going to hear me, I'll be hanged if I know. A few days passed, and no signals. Then I saw a piece in the paper that Marconi was going to send some dots—the letter "s" to be exact—across the "pond," at least he intended to try it. I thought, "I'll get in on this, and have a great time." Here I made the biggest mistake of my life. I invited all the neighborhood in to witness my reception of Marconi's signals, as they were to be flashed across the ocean. Everybody came. Oh, yes—all the ladies, mothers, fathers, boys and girls in the town for miles around. We all hung around until the time stated in the newspaper article. Up to this time, I was being talked of as "that smart little Vermilya boy," and such phrases as "I think its wonderful what a bright boy Irving is" and "where did he learn it", but after it got to be 8:30 and 9:15, and no signals, I was beginning to sweat. Several times I wanted to give it a push myself, but I knew if I did, that it would only get stuck, and give me only a long ring on the bell, so I waited—oh, so patiently. I really believed I was going to hear Marconi—even though he was way up in Newfoundland, and probably with a wave length of a few thousand meters while I had a wave of about 10 meters more or less. Mind you,

"I think its wonderful what a bright boy Irving is."

we had no such thing as a tune in those days. You merely hooked one end of the cohera to the aerial and the other to the ground. No tune about it. By this time, I began to hear in low tones—"It's a fake" and "I don't believe there is any such thing as wireless telegraphy"—"Let's go home, ma," etc.

But lo and behold—it worked. Yes it worked twice. Two good full sized dots or possibly long enough to be called dashes —and then stopped. Suddenly the door

"It's a fake" and "Let's go home ma."

bell rang, and off it went again, right along with the door bell. I went to the door, and there was the minister who had called to see how it was working. I told him of its peculiar actions, and how it had made two dashes just before he came in. But my hopes were dashed when I discovered that he had caused those dashes by ringing the neighbor's door bell mistaking it for ours. You see, the wave length of my aerial was just about right for house wiring, and I had picked up the spark from the vibrator of the bell.

For about a year I plugged away at the Morse code—determined that I was going to be an operator any way. I got another fellow, Fred Skinner, interested in the regular telegraph line, and April 3, 1903, we stretched our first line between our houses, Progress was slow, until one day, the nurse girl who took care of my younger brother, came home with a new fellow—a telegraph operator. Well, I thought "Three cheers, I'm going to get this fellow to stick around." I sang his praises to our nurse, told her what a good scout he was, etc. etc. Finally he brought two new telegraph instruments,—a brand new 150 ohms resistance main line sounders and keys. We immediately threw our small four ohm learners set in the discard.

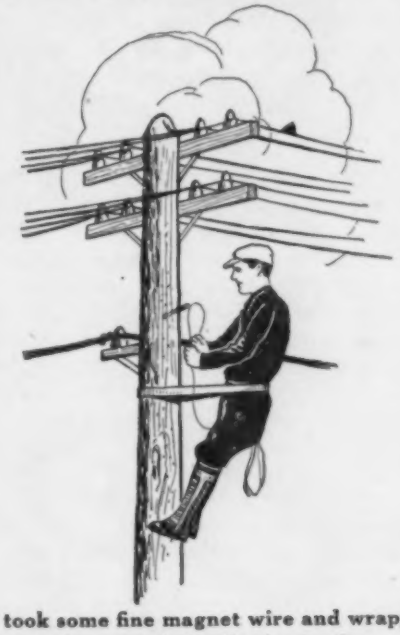
In the course of time, this line grew considerably, as my many friends can vouch for. Fellows, it was some line. After three or four years, it had grown to be six miles long, and had forty-two different fellows and girls on it. It stretched from one end of the city to the other. It even ran under ground for a distance of two and a half miles. But such a wire! I'm almost ashamed to relate it. It was made out of copper, iron, brass, and aluminum. Some parts of it were insulated, and other parts were not. And not a soldered joint.

We stretched this wire —(I say we, but it should be I, as I was elected wire chief, and for fear of getting pinched, I had full care of it) on trees, telephone poles, over trolley wires, and on back fences. Needless to say, the line was working day and night. Some one of the bunch always used it. It was the custom for every one to say "good morning" and then sign off his or her call letters, when we got out of bed, and "good night" before retiring. Some of the operators kept scandalous hours. In fact, some said "GN" after our early risers had said "GM" for the next day. So you see, some of the night hawks

"The nurse girl we had came home with a new fellow—a telegraph operator."

were constantly a day behind themselves. New Year's night was always great on this. We would hear some fellow going to bed at 8:00 a.m. next morning, after we had heard our other early risers say "GM" at 5:00 a.m. I always kept my instrument cut in, and thought nothing of hearing my pal, Milo White, say "GN" three o'clock in the morning. We always knew when any of

the fellows had been out with any of the girls on our line, as we would hear them chewing the visit over after he got home and while she was getting ready to retire.



"I took some fine magnet wire and wrapped it around the feed wire."

Then the final "Well, good night, dear."

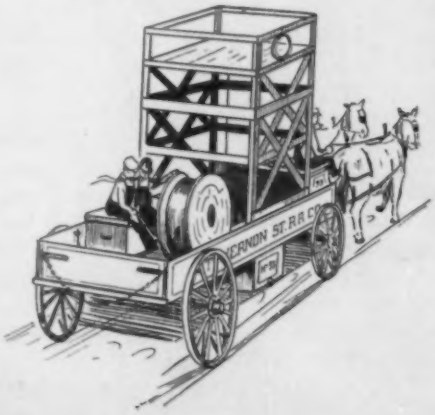
We formed a company of all the members on this line, to help bear the expense, and held regular monthly meetings at each other's homes.

Up to the time when we had about thirty-six stations on the line, we had gotten along fine as far as juice was concerned. I had all the batteries in my cellar— eighty-three gravity cells. But, the question of juice was fast becoming a serious problem, as we needed more power to overcome the great resistance of our poor line, and instruments. We had a meeting one night, and after long deliberation, decided we would have to get a dynamo, or something.

After the meeting disbanded, I called three or four of the fellows into conference —Conspiracy is what one girl called it— and told them that I intended to borrow some juice from a certain wire down on the corner. At first, they thought I was talking nonsense, but I finally impressed them that I was in earnest.

Bright and early one morning, I got up and ran the wire down to the corner. I ran in a twisted telephone line, and put it up on real insulators, so that it looked exactly like a real telephone line. Of course when I came to our point where the tap was to be made, I continued the wire on up the street, so that it would not look as though it had stopped, and would throw any pursuer off the track. The line was run on telephone poles about ten feet above the wire we were going to tap, which also ran along the same line of poles. Being a good pole climber, I put on my belt and spikes, and started up the pole on which I had previously strung our line. When I got to the "feed wire", I took out some fine magnet wire, and wrapped it around the feed wire, then I carefully cut a slit in the wooden pole ten feet up to where our line was, and made fast to our line. I laid the magnet wire in the slit I had cut, and covered it all over with putty. It would have taken a greater detective than Sherlock Holmes to ever dig that tap up, or discover it. The fact is proven by the knowledge that we had the juice coming from this source for two years.

While I was up the pole however, I had two great scares. First one was a cop, who came down the street and saw me up the pole. I thought surely he was after me, but he evidently believed I was a lineman, as he passed right on under me. The next and greatest scare, was when the trolley repair wagon came along, and I thought surely the jig was up. I had visions that I had blown out all the fuses on the trolley line, and they were after me. But they



too, passed me by without even looking up.

When I got home, sure enough, there was 550 direct current volts waiting to be used. I then hooked up ten sixteen candle power lamps in series, and put them from the tapped juice to the ground. This just made them glow, so there would of course be no amperage pulled off the tapped wire. At the fourth lamp up from the ground, I made fast our telegraph line, and then Hurrah, we had plenty of juice day and night. After this, we had no further trouble no matter how many instruments we put on, and no matter what kind of wire we put up. It always went through.

One day, we had a particularly hard run of wire to put up, and had to pass by a certain piece of property where the owner was noted for being a crank. I went to him, and said "Mr. Taylor, may I run a telegraph wire through your trees?" "You cannot. No sir" was my answer. I thanked

"Mr. Taylor, may I run a telegraph wire through your trees?"

him, for I knew I was going to run it through his joint somehow or other, even if I had to hang it on the clouds. We couldn't have any one ordinary man stand in the way of this line now. I thought it all over, and finally got out one dark night, and tacked it all along his back fence. When we came to the end of his fence, we ran it under ground in a pipe, and then up the outside of the first tree, the other side of his yard. That wire is still there I'll bet, if his fence is.

The fun began, when we had our next meeting after acquiring the "loan" of the "Tralla Lue" juice, as we called it. Only five or six besides myself were in on it. The rest still believed our batteries were giving the power. The city electrician, who by the way, was my cousin, was by this time a full fledged member of the line. His official job in real life was to have control of every wire in the city. He still holds the job. Now, of course, it would not do to let him in on it, and you can imagine what an uneasy feeling I had when he came to the door to attend the meeting. We got away with it all right, but had several narrow escapes. One fellow said "Say VN, you must have an awful bunch of batteries down in your cellar, that line is working great these days". Another fellow (the nurse's husband now) said, "Where did you get that dynamo VN?" Ye Gods, I was ready to explode. One fellow, Al Jenks, who was in on the thing grabbed up a 45 calibre pistol, that I always had hanging around loaded with blanks for amateurs, and yelled "order". After plenty of storm and stress, and a tax for more blue vitrol for our batteries, the meeting broke up. I certainly was happy.

My ease of mind was never perfect though, and I finally went to the Mayor of the town and asked him if he couldn't fix it up for me to get a little juice from the trolley. Much to my surprise, he did. He wrote a very strong letter to the Receiver of the line (it was in the Receiver's hands) and he in turn granted the permission. I was then quite happy, and that old line lasted until I finally moved away from the city. We made some great operators out of that old line just the same, and fellows, if you are ever near the Hotel Manhattan in New York City, call on Mr. Fred Coleman, who is now manager of the Western Union office there. You will never met a pleasanter man. He is a small man in size, but he certainly had a great big heart.

(To be Continued in our next issue.)

Efficient Short Wave Transmitting

Part Three

By "Dr. Radio

Part Three of Dr. Radio's famous articles is in print this time. It is devoted to Efficient Short Wave Transmitting. The article is one handled from a practical side and the mathematics involved are so simple that everyone should have the courage to look them over. This is an article which will help improve the efficiency of your set. Let's all look it over with care.—Editor.

IN the two previous articles on this subject, we have considered the broad question of transmitting efficiency, and the details of ground, lead-in and antenna. In this, the last article of this series, the writer endeavors to consider the oscillation transformer, spark gap and condenser. The same endeavor is made to treat the subject in a non-mathematical manner.

OSCILLATION TRANSFORMER

Stripped of all its mysteries, the object of the oscillation transformer is to slow up the frequency of the condenser discharge to that necessary to give the wave length desired, and also to show up the oscillations of the antenna until they are the same as those of the condenser discharge, thereby giving resonance. Finally, to give a pure wave in the antenna, the coupling is varied.

The primary coils, or those through which the condenser discharges, offer an impedance by virtue of the proximity and parallelism of the several conducting ribbons. The amount of this impedance depends principally upon the number of inches of parallel ribbon. Each inch tends to set up a reverse current in each neighboring inch. There must be enough inches used to give enough impedance to bring the oscillations down to that number which corresponds to the wave length desired. At the same time, these inches must be so disposed in coil form that they will make an efficient transformer and establish a corresponding induced current in the secondary coils and antenna.

The number of oscillations per second which corresponds to 200 meters and 425 meters, the wave lengths of ordinary amateurs and special amateurs respectively, should be determined at this point. Many amateurs do not clearly grasp the values. When we say 200 meters wave length, we mean the crest of wave No. 1 has travelled out just 200 meters from our antenna at the instant that wave No. 2 leaves. The crests of the same phase are therefore uniformly spaced 200 meters apart. The velocity with which these waves travel is the velocity of light, which is approximately 186,000 miles per second. As there are 5,280 feet in a mile, this means roughly 985,000,000 feet per second. Now a meter is approximately 3.28 feet, and 200 meters is therefore roughly 656 feet. If there is a wave crest every 656 feet, and if the total feet travelled in a second is 985,000,000, then the number of waves per second is

$$\frac{985{,}000{,}000}{656} = 1{,}500{,}000 \text{ approximately.}$$

Therefore, a condenser when it discharges must oscillate at the rate of 1,500,000 oscillations per second if it is to correspond to 200 meters wave length. If the wave length is 425 meters, the number is approximately 706,000 per second. As there is a slowing up action in the oscillation transformer primary, the condenser must allow for this, so that after the slowing up, the number of oscillations per second will be that required. But, the condenser must not be too small, and require a large amount of oscillation transformer primary to give the proper slowing down effect. It must be apparent that we

should have as large a condenser as we can have and as small an oscillation transformer as we can have, rather than the reverse, since it is condenser discharge which represents the energy which is to do our work, and not mere turns of ribbon in an oscillation transformer.

In the Secondary of the oscillation transformer, we have a similar condition. We have seen in previous articles that it is wire in the air which does our radiating, rather than lead or oscillation transformer turns, and that we should use the largest antenna we can and leave only enough margin to give a respectable efficiency in our oscillation transformer. If the natural period of the antenna is 160 meters, this leaves a slowing down of 40 meters to give us 200 meters and this is enough to give a good oscillation transformer.

This seems contrary to the statement of authorities that the best wave length is one two and one half times the natural period of the antenna. If one will consider the subject, he will see that this statement does not necessarily hold for antennas of very low natural periods.

When we proportion our condenser so it will need from one to two and one-half turns of primary to give 200 meters and proportion our antenna so it will only need six turns of secondary to give 200 meters, we shall have a very efficient arrangement. Where we depart considerably from this, we shall suffer loss in efficiency.

Before leaving the oscillation transformer, it is desirable to consider the practical matter of sizes. The magnitude of the current flowing in the primary of an oscillation transformer is not given its full respect by most amateurs. It is not realized that the current flows only a very small portion of the time while the circuit is open a much larger per cent.

It follows that things are very strenuous when the current flows. If a hot wire ammeter is placed in the primary circuit of the ordinary one kilowatt transmitting station, the owner will frequently be thunderstruck at the current. When the condenser is as large as it can be and the gap running at the right speed, the current has a value away in excess of anything that is dreamed of. With a one kilowatt new model Thordarson transformer, this current in a set used by the writer for experimental determinations, will heat a brass ribbon to approximately 150 degrees Fah. in sending a long dash. The size of this ribbon is one inch wide by 1-32 inch thick. Just what the actual current value is, while it is flowing, is difficult to determine, but its heating value gives an indication of its magnitude. It is one of the facts which is frequently overlooked by the amateur,—this matter of inadequate carrying capacity in oscillation transformer primaries. Many stations can afford to consider improving this factor. Ribbons as wide as 1½ inches should not be considered at all out of the way if one k. w. is the power used. Coils made from robust ribbon of these dimensions gives a business like effect and takes away that toylike appearance from which many amateur stations suffer.

CONDENSER.

The condenser is blamed for much more than it deserves in most amateur stations. How much to use, or how little seems to be a very obscure point. The chief reason, in the writer's mind, for this obscurity is the lack of a wavemeter, and a hot wire ammeter. With a wavemeter and the knowledge that not more than one or two turns are to be given up to oscillation transformer, it is a simple matter to add on condenser until 200 meters, or whatever wave length is wanted, is reached. Then there is no confusion. If the spark is stringy, ragged or weak, we know it is the gap and not too much or too little condenser. There is absolutely no way to attain efficiency without a wavemeter.

In construction, the best condenser for the amateur is the plate glass, tinfoil, oil immersed type. If the glass is made 3-16 thick, and is of good quality, and the tin foil is carefully put on and the whole immersed in oil, a very strong and efficient condenser is obtained, which will operate silently and satisfactorily indefinitely.

ROTARY GAP.

In the rotary gap, the universal gap of the amateur, we have the greatest of all

mischief makers, when it comes to efficiency. For a simple appearing piec of apparatus, it possesses more complications than anything with which the amateur has to deal.

The first thing to understand in a rotary gap is the matter of quenching. This is the term given to the property of quickly opening the condenser circuit, after discharge. When a spark occurs in a gap, a certain amount of the metal of the points is vaporized, and this vapor is a conductor. Unless this conducting vapor is dissipated in some manner, the condenser, or primary circuit will not be opened, and the currents in the antenna circuit will be permitted to expand work back upon the primary. This of course reduces the amount of energy available for radiation. The first duty of a really efficient rotary gap is therefore to quickly quench the condenser discharge spark. Now let us see how much time we have for this quenching.

We wil begin by a declaration taken from authoritative sources, that the number of complete oscillations which an antenna should have if the decrement is within the lawful two-tenths, is 15,—until the amplitude has decreased to one tenth of its original value. This declaration must be accepted if we are to avoid mathematics in the treatment of this subject. Fifteen complete oscillations of a 200 meter wave length are completed in

$$\frac{15}{1{,}500{,}000} \text{ or } \frac{1}{100{,}000} \text{ of a second.}$$

If the wave length is 425 meters, they are completed in

$$\frac{15}{706{,}000} = \frac{1}{47{,}000} \text{ of a second. The}$$

former is expressed decimally as .00001 sec. and the latter, .000021 sec.

Therefore, it is plain, that if our condenser spark is to be quenched out, and the primary circuit of our oscillation transformer opened as soon as the antenna circuit, or secondary, has attained full swing, we must act very quickly. The question that next arises is how quickly? We now must turn to another determination made by the authorities who have investigated. They have shown that four oscillations of the primary circuit are sufficient to transfer all the energy from the primary to the secondary circuit. Even one or even one-half of one (a single phase) would do; but four is the limit if the best efficiency is to be attained. Now, how long a time is four oscillations? For 200 meters wave length it is

$$\frac{4}{1{,}500{,}000} \text{ or .00000266 sec. and for 425}$$

meters $\frac{4}{706{,}000}$ or .00000567 sec. These seem very short intervals of time, and to appreciate them, we must look at one of our ordinary gaps and see what its interval of contact is.

Suppose the rotating studs are on a 6 inch circle, and turn at 2,400 rev. per mn. and the diameter of the stud is ¼ inch. Suppose also that while the rotating and the stationary studs are passing across, their actual diameters of ¼ inch is the time presented for the spark. It may be more or less in practice, but as this varies, we will assume the above as a basis for this study. The time that the rotating stud requires to pass the stationary stud would be .025 sec. per complete revolution

$$\text{x } \frac{\text{.25 inch width of stud}}{\text{6 inch diam. x 3.1416}} = .00033 \text{ sec.}$$

And it should be only .0000026 sec., which makes it one hundred and fifty times longer than it should be for a 200 meter wave. The writer maintains that most of the rotary gaps used by amateurs are the cause of tremendous losses, principally because of absolutely deficient quenching.

The easiest method for the amateur to improve his quenching is to increase the linear velocity of the moving studs, and decrease the width of these studs. An example of a gap made by one amateur known to the writer is very instructive. He made his rotating member 12 inches diameter, and he used eight studs and drove them at 3,600 R. P. M. The studs were .07 inch wide, both stationary and moving. Let us see what the time interval is in his gap, assuming the contact is while the studs are passing across their widths, or .07 inch. His motor runs at

3,600 R. P. M. or 60 per second, or one revolution in .0167 sec. If the whole circle of 12 inches diam. is covered in .0167 sec., the width of one plug is covered in

$$.0167 \times \frac{.07}{12 \text{ inches} \times 3.1416} = .0003 \text{ second.}$$

He is about ten times better off than the ordinary gap on 200 meters, but since he is working on 425 meter,s he is more than twenty times better off. His wave is noted for its sharpness and long range.

He could do still better, however, and this would be to run at higher speeds and run both sets of studs. If two motors were used one running his one set of studs one way and the other running what would correspond to the stationary studs the other way, a very high linear velocity would be attained. A speed of 7,200 R. P. M. has been attained by the writer in one gap he has made and when properly balanced and housed, it runs quietly. If both members were rotated, the relative speed of passing studs would be 14,400 R. P. M. The number of studs would be reduced to two of course, to give proper spark frequency. Such a gap would have its plugs prezented to each other only .000007 sec. and the quenching would be so good that the closest of coupling could be used in the oscillation transformer, and still have a pure wave. Thus we see the value of a "quick get-away" in a rotary gap, if we may be pardoned for the expression.

Another trouble frequently suffered by the amateur is spark frequency. The customary method of handling this spark frequency matter in amateur stations, is to take whatever comes handy in the way of gap speed and spark frequency, and alter condenser proportions unti a satisfactory tone is attained or a satisfactory radiation. This of course completely upsets all the chances of efficiency since there is only one condenser capacity suitable for a certain wave. If the gap does not operate properly, it should be changed and not the condenser. If a gap gives a rough unmusical scratching tone, it is because the interval between studs has not been enough to charge the condenser to a value which will enable the gap to be jumped every time a stud presents itself. Some times it is the distance between the studs, but more often it is too high a spark frequency. If the former, it is easy to close up on the gap distance. If the latter, the NUMBER OF STUDS should be reduced, not the revolutions per minute. The latter never can be too high, as we have seen.

Where condensers are frequently punctured or where excessive brushing occurs, the amateur usually is tempted to add to the number of studs. This gives a higher pitch, and the more frequent impulses sometimes will make the ammeter reading higher, but it does not mean that each impulse or wave train represents more energy. It would have been better to have looked at the condenser to see if more capacity could not be used. If less oscillation transformer primary could be used, and more condenser, more energy could be stored up each time and more would be given out each time. The ammeter reading would be increased, and when this occurs without any increase in spark frequency, we know we are hitting harder each time, which is the great desideratum.

This statement should be taken within limits, for you may remember that the voltage plays an important part in the power. A point can be reached where the condenser capacity is too great, just as it may be made too small. The best remedy for puncture of condensers is to build a series multiple type which reduces the strain on each plate.

As a general proposition, the amateur cannot easily quench by cooling. It is easier for him to do his quenching by utilizing very high speeds. The latter gives not only quick get-away, but also sets up violent currents of air which serve to blow away the incandenscent vapors, even if they do not produce actual compression of the air, and cooling effect.

In closing this article, the writer desires to repeat that the effort to make it non-mathematical raises many points which can easily provoke argument. He hopes, however, that the effort will be of assistance to many amateurs who want general operating results, and who are not as well able to achieve them by mathematical advice as well as by non-mathematical,

Concerning Towers for the Amateur

By H. E. Rawson

WITH interest in amateur wireless everywhere increasing and more pretentious stations constantly being erected, it is quite natural that high aerials should come in for their share of attention. While seldom of advantage to the amateur for relay work, they nevertheless make possible much experimental and long-wave work that is practically impossible with low aerials. It is our belief that the apparent difficulties of erection of towers over one-hundred feet high generally frighten the enthusiast out of even giving careful thought to the problem. It is in the hope that this bugaboo may be robbed of its terrors that the present article is written.

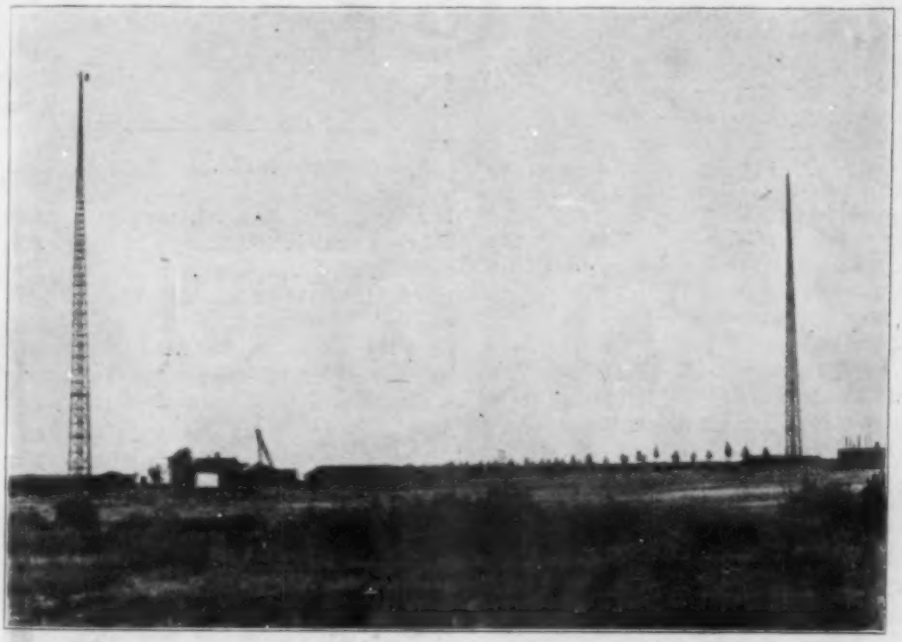


Fig. 1

The two towers shown in Fig. 1 measure 165 and 20[illegible] feet high respectivly, and are set 450 feet apart. They were built and erected by a grand total of some five or six people—two carpenters who sawed the joints and braces—a plumber who used to erect windmill towers—a helper and myself. They are of wood entirely—Oregon fir—than which there is no meaner, nastier, splittier wood—the four uprights are 4x4s—mostly eighteen feet long—the bracings are 2x4s until near the top and then 1x4s. The ends of the uprights were cut as shown in Fig. 2—opposite ends of the same pieces being cut at right angles to each other. When these were all cut we measured off on the ground the length we wished to make the towers and laid out one side—starting with the base pieces (which were 6x6s) 6 feet apart for the shorter tower—8 feet for the taller—and converging until they met at the other end. The

4x4s were butted together inside two bands of iron one inch wide and about three-sixteenths thick, and bolted with a single bolt

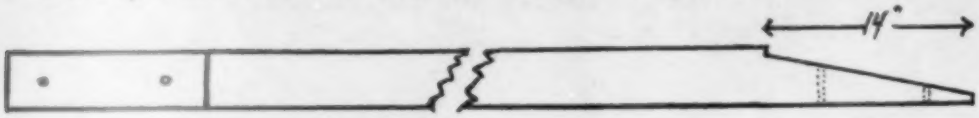


Fig 2.

through each band. The bracing 2x4s were zigzagged on being merely tacked in place with small nails but holes bored for the five-sixteenths inch bolts that were used throughout. When this side and another just like it were completed side by side on the ground, they were tipped up on edge and pushed to the correct place for the braces on a third side to be cut and tacked on—then the whole thing rolled right over and the fourth side fitted out. Here we had the tower in what might be called a knock-down condition—all cut and fitted but not permanently assembled. Then all the braces and uprights were carefully numbered and from about 65 feet up were knocked apart and piled up where the base of the tower was to be.

The erection of the first 65 feet in one piece was a surprisingly simple matter. The braces were of course bolted firmly on and the section was extremely rigid. A small pit was dug a little larger than the base of the tower and about three feet deep. The two bottom legs of the tower stuck out over this pit about two feet six inches. Two planks 2x12 were bolted top and bottom of these legs right at the edge of the pit, and extended about three feet either side of the pit. These made the pivot on which the tower turned in being pulled up. A chain was around each end and brought back to iron stakes driven in the ground to hold the tower from sliding forward over the pit instead of pivoting on the 2x12s. Two 2x8s twenty feet or so long were then bolted together loosely about a foot from one end to make a kind of scissors—each leg of which rested on one of the bottom legs of the tower and over the top of which passed a rope which was fastened to the top of the tower. This rope led to a block and tackle some distance off. The tower in this position with rope and scissors is clearly shown in Fig.3.

We lifted her a little ways by hand and propped her up as you would a big pole in a power line. Then we hooked two autos onto the block and tackle and pulled

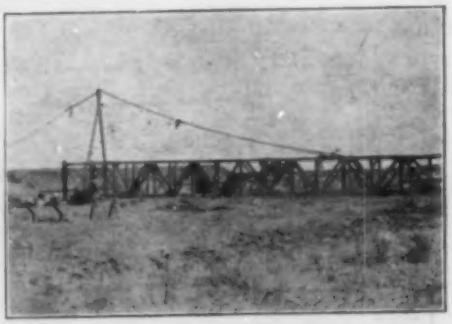


Fig. 3

her right up. A check rope was run to a heavy post in the rear to keep her from coming on over. Fig. 4 shows her propped up ready to be hoisted while Fig. 5 is at the balancing point. The scissors has dropped out being only used to get a purchase at the start. Once erect and trued, concrete and rock were piled around the

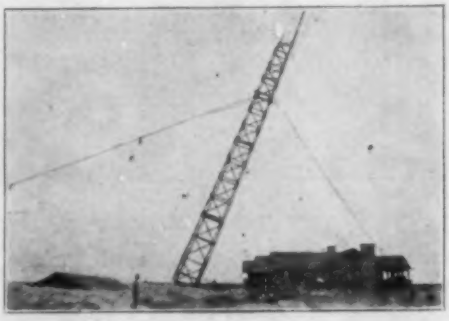


Fig. 5

base and in forty-eight hours she was solid. (It might be well to mention here that we have only about four feet to dig to

pretty solid hardpan in this country and extensive foundations are not necessary.) The erection of the remaining part was a simple matter. A small gin-pole or derrick

solid it really does feel when you are sitting at the top of the big one in a stiff breeze.

Continued on page 38

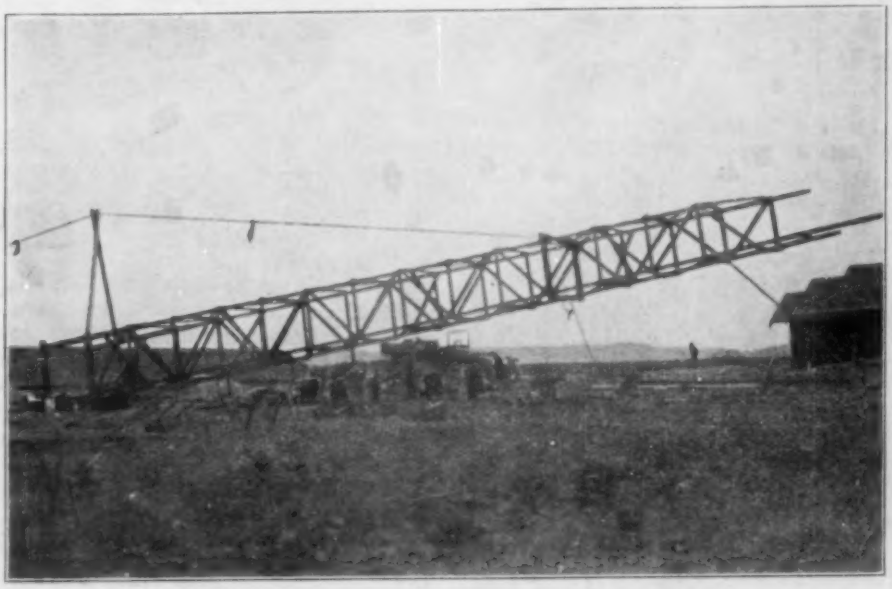


Fig. 4

was rested at the top— a corner-piece would be hauled up from the ground by the helper and set in place by two of us at the top, the bands holding it while we quickly put the braces already hauled up into place and bolted securely. Then the derrick would be moved up a ways and the process repeated. The splices of the corner uprights never came on the same level, of course, but ran in a spiral around the tower thus minimizing strain. The rapidity with which this went forward is seen in the erection of the 200 foot tower complete by three of us in two weeks.

The guy wires consist of three-eighths inch galvanized stranded cable, insulated every fifty feet with porcelain insulators. The small tower has three sets—the larger four—running in four directions. While we have had some very severe wind storms during the two years that these towers have been in service, there have been no indications of weakness or strain—in fact, it is a very distinct pleasure to feel how

Fig. 6

Department of Defence

By Edgar Felix

AMATEURS, ORGANIZE FOR SERVICE

IN 1913 certain men and women recognized as leaders of thought by many thousands and even millions of people, in many different countries—England, Germany, France and the United States—asserted and re-asserted that the world would never again suffer from a great war.

One said: "The much heralded great war will never come."

Another said: "Civilization will never again permit such a catastrophe."

A third said: "Humanly speaking, it is impossible."

And millions of men and women believed these assertions.

We have at least learned two things during the last three years. First, war CAN come in our day and age; second, it can come most unexpectedly.

It is our duty to prepare in every line.

OUR NEEDS

As aerial service is the eye of the modern army, so radio service is its ear.

What chance would a man have in a boxing contest, if he were both blind and deaf?

With shame, we of the United States must admit, that, in proportion to our size and resources, we are more unprepared in aerial and radio service than any other nation in the world. Practically all our government radio stations are within a few hundred yards of the coast.

OUR OPPORTUNITY

It is our duty then, as members of the American Radio Relay League to put ourselves in condition and to organize ourselves as a whole so that we may render service, valuable as well as patriotic whenever our country finds itself in need of us.

Perhaps you think that you individually may be of little value.

WHAT BOYS HAVE DONE FOR FRANCE

Perhaps it seems incredible, but no one can imagine the confusion that would have existed in France during those first years of the war if the city of Paris had not been given the service of hundreds, even thousands of boys—sixteen, fifteen, twelve, even ten years of age—boys of Les Eclaireurs de France—the Boy Scouts.

Think what it meant for several thousand boys, not only in Paris, but all over France, to be ready on three hours' notice to act as messengers, to conduct thousands of army officials and subordinates from one office to another in the great buildings of the Department of War and the Department of the Navy, to deliver special messages, to help with the telephone and telegraph, to co-operate in radio work, to even help in the police service and the postal service.

Paris is a city of over two million people. Practically all of its men between the ages of twenty and forty were called out within forty-eight hours after the beginning of mobilization. Each soldier wanted to send messages to other members of his family; the post office was flooded with telegrams and special delivery letters. Many of the postmen themselves were called to service, thus reducing those ordinarily in service. But the Boy Scouts followed their orders and everything was handled without confusion.

POSSIBILITIES OF RELAY WORK

One who witnessed the remarkable work of these boys, not only during the first days of the war, but each day since the order of mobilization was signed, cannot but

realize how much organized service on the part of the American Radio Relay League would mean to America, if we, on twenty-four hours notice should be subjected to the same needs to which France was subjected.

PURPOSE OF DEPARTMENT OF DEFENCE

The purpose of this department is to organize the trunk line system on a basis of reliability. In any work undertaken for the government in time of emergency, dependability and accuracy are essential.

To secure this result organization of routes on schedule is necessary. If you volunteer for the defence service, you will be assigned a watch of but fifteen minutes, in which time you will receive a test message from a designated station, and forward it at a certain pre-arranged time to the next station on the schedule.

YOUR SHARE

If the organization of this work is properly completed, its success will depend entirely on the way in which every unit conducts itself. In case of war, if you are a true American, you will be on the job when required; you will "stick to your key" until—relieved.

All that is asked of you is fifteen minutes, twice a month. Perhaps it will be more than twice a month, but for the present that is all that is planned.

Will you do your share?

If it happens to be just the time of your wedding, which has been decided on only a few minutes before, and there is no time to report the matter to the manager of the route, and if you have, after the most strenuous effort been unable to arrange the marriage either in the wireless room, or by proxy, what will you do?

To prepare for such an emergency—(which might occur to any of us)—first, you should provide for an assistant operator. If you have no friend who can take your place, it's time you begin to train one, if your station is to be of value in time of emergency.

Second, if your station is going to be dismantled, or if an emergency such as was previously described, should arise, there should be time to report it to your route manager, who can arrange for a substitute station.

As a unit of the whole system, your part may appear to be an insignificant one. But a chain is as strong as its weakest link, and if you fail in your duty, the efficiency of the entire system will be lowered.

Before a relay is conducted by this department, a complete route and time schedule will be prepared. In order to assure the accuracy required in this work, there will be no long gaps, thus reducing the possibility of interference and other unfavorable conditions.

As dependibility is the one requirement sought, routes will not be extended where trunk line managers have not had success in sending the relays as planned at present.

THE SERVICE THE A. R. R. L. CAN RENDER

The naval radio stations are already overburdened with work (as anyone who trys long distance work within a few miles of one can testify.)

In time of war, these stations will have much more work tha they can handle. The telephone and telegraph service will also be inadequate for the extra pressure of work placed upon it.

Naval radio stations will be subject to aero attack, as all of them, with a very few exceptions, are within sight of the coast, and within easy reach of aero bombs.

In such case, a properly organized relay system would be of inestimable value.

ESSENTIAL UNIT OF SYSTEM ALREADY THERE

The net work of amateur stations covers the entire country. In every large city, there are numerous stations, and they cover the country districts in such numbers that they can form the neucleus of a most valuable and efficient system.

Only one thing more is necessary to accomplish this result. It is organization. If each of us know what to do, and when to do it, we can be of inestimable value.

GREAT RELAYS OF HISTORY

Most of you know how the Greeks got the news of the battle of Marathon to Ath-

Continued on page 38

A New Type Rotary Gap

IT has been our good fortune to secure permission to show a new type of quenched rotary spark gap, which we believe will be of value to the amateurs of the country who are interested in efficient transmitting. This gap has been in operation on long distance transmitting and its tone and quenching effect are altogther better than what is obtainable from the ordinary low speed, small diameter, round studded gap.

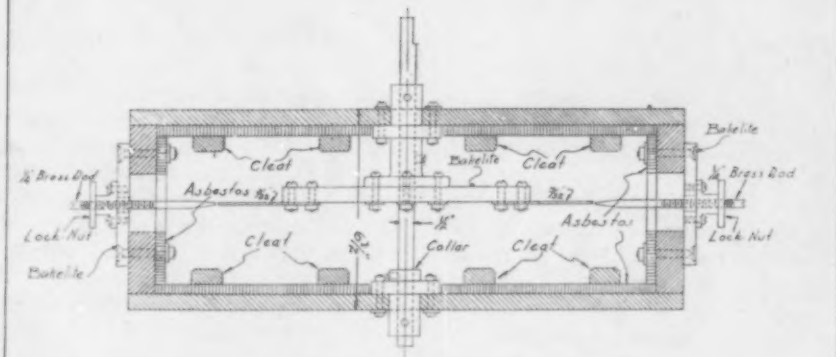
The essential feature in this gap is its extremely high circumferential velocity, and consequently the exceedingly short interval of presentation of sparking points. This high velocity is obtained by making the rotor twelve inches diameter instead of six inches or seven inches, as is frequently used. This large diameter, coupled with a rotative speed of 4,000 R. P. M. gives a surface velocity of 210 feet per second. The width of the sparking points is made 1-10 inches, and this, at the high velocity of travel, gives an extremely quick discharge. This quickness of discharge is what is so valuable in securing a sharp wave. The condenser circuit is opened quickly, which allows the aerial circuit to oscillate freely and avoids retransferring energy back into the condenser or primary circuit.

The drawing illustrates the gap construction very completely, and only a few explanatory notes are necessary to enable any one to construct one of them. The box can be made of any wood. The joints should be tight in order to prevent the escape of the noise of the spark. The asbestos lining assists materially in deadening the sound. It is not strictly necessary. The bearings are small brass flanges and these can be procured through QST at a small increase in price over the current price of brass castings. Any amateur can pick up suitable flange castings at any brass foundry. The drawing shows the two bearings of the same size flange, and the disc supporting flange of another size. This can be changed if desirable, and all three flanges made alike.

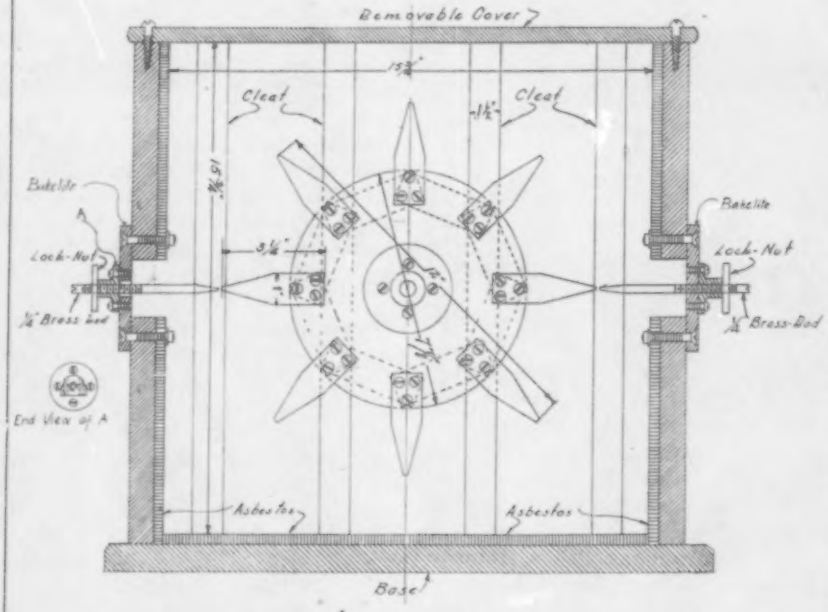
The rotating disc is bakelite and must be carefully balanced so that at the very high speeds to be used, there will be quiet running. The sparking points are flat pieces of brass screwed through the bakelite disc, and all connected together electrically by similar flat brass pieces. Small collars provided with set screws give provision for properly locating the disc laterally. The gap is intended to be run by belt. The speed of 4,000 R. P. M. can be obtained by having the proper sizes of pulley on motor shaft and on gap shaft. This belt drive avoids all danger of grounding and burning out the motor.

The terminals are small brass flanges shown in end view at A. These flanges are screwed to small bakelite discs, which in turn are fastened to the ends of the box by through bolts. The adjustment of the gap is obtained by the threaded brass rod and the lock nut. If the bearings are carefully reamed, and set up accurately, a gap at the sparking points of only .005 inches is easily obtained. The small flanges shown at A should have the flat hub shown, in order that a good contact with the flat ribbon lead may be made.

The burning away of the points of this gap is very slow and can always be compensated for in a moment by adjusting. If it is carefully made, it runs almost noiselessly. Its tone is peculiarly hard and far-reaching, and without any sacrifice in musical qualities. This is undoubtedly another advantage coming from the extremely quick make and break interval. Where a very low note is preferred, there should only be six sparking points in the disc. It would not be right to vary the tone by varying the speed, because it is the velocity which gives the gap its great value. We are sure that many of our readers will be able to more than double their present sending range with a gap of the construction shown.



PLAN VIEW



SECTIONAL VIEW
SPARK DISCHARGER

Scale:
2 inches = 1 foot

The Multi-Audi-Fone

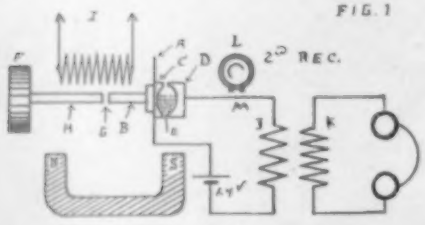
By Leon W. Bishop.

THE Multi-Audi-Fone is an electro chemical amplifier that increases damped and un-damped Radio signals many times their original audibility with any kind of a detector.

Figure (1) shows a diagram of a one step Multi-Audi-phone. This is the first official diagram ever published of this instrument. In the diagram "A" is a tiny diaphram which supports a soft iron pole piece "B" and a special metal electrode "C". Between this vibrating electrode

DIAGRAM OF A MULTI-AUDI-FONE.

FIG. 1



"C" and stationary electrode "D" is a special chemical compound "E" which is extremely sensitive to the most minute vibration of the diaphram "A".

The adjustable handle "F" which may be seen on the outside of any Multi-Audi-Fone case varies the magnetic leakage of the gap "G" by the use of a soft iron pole piece "H". The whole aparatus is surrounded by a magnet which is shown below in the diagram.

The 2000 Ohm winding "I" surrounds the pole pieces and is connected in place of the telephone receivers to the wireless aparatus; i.e. it is connected to the fixed condenser in the case of a mineral detector and in the battery "B" circuit when used with an Audion. The slightest variation of current in the coil "I" upsets the perfect magnetic balance of the pole pieces "H" and "B". This causes the diaphram "A" to vibrate. This vibration varies the resistance of the chemical compound "E" and thus one cell of dry battery energizes the primary "J" of the step-up induction coil. This induction coil is so designed that it steps this amplified current up to a pair of 1000 Ohm receivers through the secondary "K". It is always advisable to use a head set having a total resistance of 2000 Ohms although it will work very well with a 1000 Ohm head set or a 3000 Ohm set.

Any amateur having a Multi-Audi-Fone and who may wish to use an extra pair of receivers on it may do so by winding up any old phones that he may have with a few turns of No. 24 wire, that is the receiver should be two Ohms or less in resistance. This receiver may be inserted in series with the dry battery. In the diagram the receiver "L" may be inserted anywhere in the local battery circuit as suggested by "M".

The much talked of Two Step Multi-Audi-Fone is not merely two of our above described types in cascade but a specially constructed first and second step which requires the use of two additional cells of

COMBINATION MINERAL AND AUDION CIRCUIT.

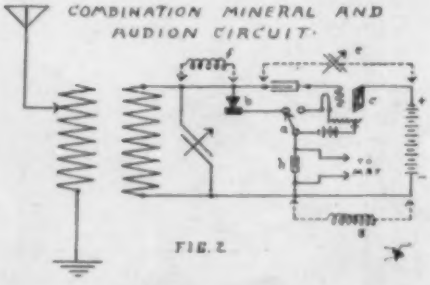


FIG. 2

dry battery to operate the horn.

This Two Step Multi-Audi-Fone will bring the signals out much louder than any amplifier. It is surprising how loud some of the distant signals have been heard many feet from the horn.

A very unusual and efficient circuit is described in figure "2". The exact location of the Multi-Audi-Fone in the circuit

is clearly shown.

This circuit is unique in the fact that a double point switch "A" will throw from a mineral detector "B" to an Audion "C" with one movement including the lighting of the filament. This circuit may be quite readily changed to the regenerative for the reception of long waves by the adition of a variable condenser as shown at "E" and two coils "F" and "G", being the secsecondary load and the coil "G" the wing circuit or oscillating coil.

The phone condenser "H" should also be variable although I have found by experimenting that this condenser may be variable in small lumps of capacity by using what is known as a fan switch The two wires marked "To Multi-Audi-Fone" may also be connected to a pair of phones as the Multi-Audo-Fone merely replaces the phones in any circuit where it is used. This circuit may also be utilized as a re-regenerative circuit for short waves and works very effiiciently with a one step Multi-Audo-Fone.

The great advantage in the Two Step Multi-Audo-Fone is the fact that it brings out all signals in such volume that they may be heard all over a hall or lecture room. Another advantage is the fact that the regenerative receiver when used with a Two Step Multi-Audi-Fone is not nearly as sensitive to the capacity effects of the body as when the phones are used.

Many very interesting experiments have been performed with the Multi-Audi-Fone by recording and making audible various difficult and distant stations.

Amateur Work at the Mexican Border

By Sgt. George T. Droste

Now that the amateur relay season has begun again, or more correctly is well on its way, you may be interested in knowing what stations I have been able to hear on the Border. My receiving antenna consists of an umbrella aerial of twelve wires, each 85 feet long, supported by a mast 72 feet high. An insulated counterpoise of eight wires, each 65 feet long, makes the other connection.

Although so far only a few stations have been heard, the prospects are that I shall hear many more. My outfit is located at McAllen, Texas, about 68 miles northwest of Brownsville and close to the Rio Grande. Although officially engaged for Uncle Sam, I still have an ear for my amateur friends. My own station .2EU, sorry to say, must rest until I get back,

Exceptionally good work is being accomplished by 5ZC at Dallas, Tex. and 5DU and 5AA at Waco, Tex. Their signals come in very well. 5ZC is particularly clear. I am in hopes of being able to handle some relay business from them and to the Border from points north.

On the night of October 31st, and again on November 1st, at 10:50 P. M., Border time, or 11:50 P. M. Washington time, I heard 9ABD working 9EK and also calling 9RD. His signals were easily readable. At 12:00 Midnight, I heard 9MQ calling 9MY and his signals came in fine. It may be appreciated when I say that the signals were heard with an Army Pack Set using a Lenzite detector. On the night of November 2nd, I heard 5DU calling 9YA and 5YG calling 9ABD. Also copied a Ninth District station in St. Louis, giving his location. The call signals were lost due to local interference.

I am using a quarter Kw., 500 cycle, 110 volt generator run by an Evinrude engine. We carry on a continuous business with the Army stations at San Antonio and Brownsville. I shall try to make some tests with 5ZC at Dallas, some 500 miles north.

Considering the use of a crystal detector and a 1915 type Field Pack Set, I consider this very fair receiving and will be glad to advise any amateur I hear working. Many may not realize they are reaching as far south as this. Our call is NYA and this is a detachment of Company A, First Battalion Signal Corps, National Guard, New York.

REPORT OF TRUNK LINES
"A," "E" and "G"

As we look back upon the achievements of this fall in amateur work, we may be pardoned for a feeling of pride over the way in which message work has been handled over our new A. R. R. L. routes as compared with last year's haphazard work. The two weeks preceding New Year's day have put a heavy strain on all of us, and I am very proud of the way in which all of my routes have acquitted themselves. To give an idea of the amount of traffic handled during the holidays, the following figures are listed:

During the two weeks before January 2nd, 2AGJ handled 150 messages, most of which were for Chicago, and the west, and came from New York via either 2LK or 2ABG.

9GV handled 127 messages.

8NH handled 138 messages.

9ZN handled 148 messages—two of which were direct from 2LK, one direct from 1ZL, two direct to 2ABG, three direct to 5ZC, and twenty direct from 2AGJ.

9RP handled 43 messages

What is thought to be a record for amateur message relay work was made on two messages on the night of December 31st and the morning of January 1st. One message, originating at Bloomfield, N. J., was to Dallas, Texas, and the other from Philadelphia direct to New Orleans. They were transmitted from 2ABG to 2AGU who gave them to 9ZN. About an hour later, they were given direct to 5ZC at Dallas, by 9ZN, and 5ZC forwarded the New Orleans message through 5AX; nearly 2,000 miles. Albany, Chicago, Dallas, was thus covered in two steps and messages received O. K. at the end. We claim that is not a bad record.

Stations 9ABD and 5BV have been rushed too, as between these two stations, with 9XN, all west-bound traffic through 9GV and 9ZN was forwarded.

Mrs. Candler at 8NH has been kept jumping, too. The writer has heard as many as six stations calling 8NH with messages at the same time.

Now, honestly, and without flattering ourselves on our League, could we have successfully handled as many messages as were handled during the holidays by our old system?

Mr. Hewitt of 2AGJ reports that December 17th he and 9GV had so many messages to exchange that they did not stop till 6:45 A. M. when it was daylight at 2AGJ! Also, on December 16th, between 9GY and 9ZN, twenty-one messages were taken from 2AGJ and they did not stop until 6:30 A. M. We don't believe that Hewitt ever sleeps, as he can be heard at any time of the day or night with message after message buzzing away with his 133 cycle hum.

Station 9RP at Rockford reports that on December 31st, he heard the following very QSA: 9AIR, 8AEZ, 9TR, 9MQ, 9LR, 8NF, 2AGJ, 5ZC, 9EG, 9GY, ,9GJ, 8NH, 9DV, 9FV, 9HX, 9ABD, 9PC, 8AHI, 8PA, 8CS. He also reports that he copied New Year's messages from 2AGJ and 8NH for over two hours! 9RP was reported as QSA by 2PM and 5ZC during December.

Although New Orleans is not properly in our territory, an opportunity of opening such a route was presented and we took advantage of it, but will beg Mr. Hebert's pardon for our intrusion upon his territory.

Station 9RW, at Sheboygan, Wis., asks that all stations hearing his sigs will please notify him, as he is a new station and wishes to determine his range.

Mr. Guy E. Wilson of station 9EP at Kansas City, Mo., has been made assistant to station 9QM, also of Kansas City, on Branch Route No. 21.

The Scott High School of Toledo, Ohio, formerly 8JO, has a special license and its call is now 8ZL.

As we write this report, we are upon the eve of what promises to be the greatest event in amateur wireless work. We

refer to the Trans-Continental Relay which is to be sent via A. R. R. L. routes from the Atlantic to the Pacific. A full report of this great undertaking will be found elsewhere.

CHANGES ON TRUNK LINES.

A few changes have been made in the personnal of the Routes: 8SK, now 8ZP, at Buffalo, has replaced 8JX on Route A.

Route E has been extended to New Orleans via 5ZC, 5AX, 5ZS, 5BB.

Station 9IK is now using waves of 200 and 425 meters under the call of 9ZN.

Asterisks (*) denoting trunk line stations should be placed after the following stations in the report of Trunk Lines A, E, and G, in the January issue:

Cambridge, Mass., 1LE; Fall River, Mass., 1ZF; Northampton, Mass., 1ZL; Valley Stream, L. I., 2LK; Albany, N. Y., 2AGJ; Buffalo, N. Y., 8SK; Cleveland, Ohio, 8JZ; St. Mary's, Ohio, 8NH; Chicago, Ill., 9ZN; (9IK); Grand Forks, N. D., 9XN. The rest are correct as given.

(Signed) R. H. G. MATHEWS, Manager,
1316 Carmen Ave.,
Chicago, Ill.
9ZN (9IK).

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REPORT OF TRUNK LINES "B" and "F"

December (1916) Tests

Decemeber 3rd.

Sent our "9:50 P. M. QST" for all to QRT and QRX for relay test message at 10:15 P. M. Transmitted message ("Hurry the radio along") to and QSLed by 6AAG (Pomona). He calls San Diego with test message. 6RG tells 6AAG that same was received direct from 6EA: We called the northern relayers with no reply. 6AAG did the same. We broadcasted test message which was QSLed by mail from 6FT (Palto Alto) and 6DM in Phoenix, Ariz., direct from 6EA.

December 7th.

Sent usual QST. Called 6AAG with no reply. Transmitted test message ("Carry me through space") to and QSLed by 6RG. Called several relayers up north, but local QRM too bad for QSL, so broadcasted test message which was QSLed by mail from 6FT and 6FU (Nordhoff), direct from 6EA.

December 10th.

Sent usual QST. Began using audion tonight. Sent test message ("Let us all be on duty") to and QSLed by JS (Lodi), 6BY (Richmond), 6HO (Piedmont), and 6RG. JS and 6BY attempted to get test message up to 7ZH and 7SW, but without results. We broadcasted same, which was QSLed by mail from 6RJ (Ione), 6PN (Acampo), and 6FT.

December 14th.

Followed usual program. Transmitted test message ("Prove yourselves efficient") to and QSLed by 6AAG, 6BY, and 6RG. Local QRM was very bad, especially from a spark coil ham. Broadcasted same with no QSLed by mail.

December 17th.

Began same as usual. Sent test message ("Able amateurs are appointed") to and QSLed by 6ZW (Bakersfield) and 6BY. 6ZW QSRs same to 6BJ (Centerville). Local QRM bad tonight. Broadcasted test message and was QSLed by mail from 6AU (San Jose), 6FT, and JS, who QSRd same to 6HH, 6KU, 6PN, and 6RJ.

December 21st.

Same as above. Radioed test message ("Competent workers are needed") to and QSLed by 6AAG and 6BY. He tells us that 6ZW received message direct from 6EA. 6BY and 6ZW sent same to JS. 6BJ, 6BY, and JS called KDP without answer. Sent message broadcast and QSLed by mail from 6AU and 6SR (San Diego) direct from 6EA. 6PN received test message from 6ZW. 6FT will not be on duty tonight. Will spend a few days with a friend at Pacific Grove near Santa Cruz.

December 24th.

Began the usual way. Sent test message ("Merry Xmas to you all") to and QSLed by 6CR (Fullerton). He told us that 6AAG had pole trouble from strong wind. Broadcasted message.

December 28th.

Started in the same way. Called 6AAG with no answer. 6EA and 6OK sent test message ("Show what you can do") to and

QSLed by 6BJ. 6KU (Walnut Grove) calls KDP with no reply. Broadcasted test message. 6AU received same from 6BJ and QSLed by mail to us.

December 31st.

Test message: "Start the New Year right." Local QRM pretty bad tonight. Broadcasted relay test message to relayers up north, down south, and to the east. 6OK sends test message to 6BJ. Sent New Year's Greetings to all relayers on our Trunk Lines after twelve o'clock.

Great credit is given to 6AAG, 6FT, 6RG, and 6HO for being on the job regularly.

(Signed) SEEFRED BROS., Managers, 6EA.

TRUNK LINES, B, F, AND H TO DATE.

TRUNK LINE "B"

PORTLAND, ORE.
KDP
LA GRANDE, ORE.
7ZH
KUNA, IDAHO
HER
SALT LAKE CITY, UTAH
6ZV and 6SL
RICHFIELD, UTAH
6AL
VICTOR, COLO.
KIW
DENVER, COLO.
KIX
?
?
LINCOLN, NEB.
9AHR
ST. JOSEPH, MO.
9HU
LEAVENWORTH, KANS.
ALS
TOPEKA, KANS.
9JW
LAWRENCE, KANS.
9LQ
KANSAS CITY, MO.
9MQ, 9EP, and 9LO
COLUMBIA, MO.
9HX
CAPE GIRARDEAU, MO.
9NN

TRUNK LINE "F"

SAN DIEGO, CAL.
6RG and 6SR
LOS ANGELES, CAL.
6EA and 6OK
BAKERSFIELD, CAL.
6ZW
FRESNO, CAL.
6ZF and 6ZD
SAN JOSE, CAL.
6AU
PALO ALTO, CAL.
6FT
CENTERVILLE, CAL.
6BJ
HAYWARD, CAL.
6SI
ALAMEDA, CAL.
6AHN
PIEDMONT, CAL.
6HO
BERKELEY, CAL.
6WL and 6JZ
RICHMOND, CAL.
6BY
STOCKTON, CAL.
6SH
LODI, CAL.
JS
ACAMPO, CAL.
6PN
IONE, CAL.
6RJ
RENO, NEV.
6AV
?
PORTLAND, ORE.
KDP
LACEY, WASH.
7YS
HOQUIAM, WASH.
7DJ

TRUNK LINE "H"

LOS ANGELES, CAL.
6EA and 6OK
POMONA, CAL.
6AAG
REDLANDS, CAL.
6BV
PHOENIX, ARIZ.
6DM
DALLAS, TEX.
5DU and 5ZC
KANSAS CITY, MO.
9MQ, 9EP, and 9LO

ANNOUNCEMENTS.

Relay test messages will be sent out from here (6EA) at 8:15 P. M. (Western Time) every Thursday and Sunday hereafter. We want all relayers to try and be on the job these nights.

Any relay station appointed on Trunk Lines B, F and H, who wants to know if he is still on the list will find out in QST magazine each month, as there are a few of the fellows we are dropping off the list on account of not being on the job often enough on test nights, and who are not taking much interest in the relaying of test messages.

(Signed) SEEFRED BROS.,
343 Fremont Ave.,
Los Angeles, Cal.

*****

CALL LISTS OF STATIONS HEARD BY OUR TRUNK LINE STATIONS DURING DECEMBER

Heard at 5ED, Houston, Texas: 8NF, 8NH, 8AEZ, 8JZ, 8AEH, 8YI, 9YO, 9MQ, 9NN, 9GY, 9AET, 9ABD, 9HX, 9JW, 9WC, 9VY, 9WG, 9GJ, 9BA, 9ME, 9ZN, 9AHO, 9DV, 9AKP, 9EP, 9NE, 9AGB, 9FW, 9EG, 9AZ, 9AMI, 9JI, 9YS, 9TA, 9QL, 9UK, 9AAD, 9PF, 9DH, 9ZL, 9VP, 9VN, 5AD, 5DX, 5DU, 5AX, 5ZC, 5YG, 5AY, 5BV, 5ZM, 5BP, 5ZA, 5BT, 5AB, 5EF, 5DC, 5BJ, 5ZS, 5BB, 4AC, 4AM.

Stations reporting having heard 5ED—5DX, 5AX 5AD, 5BV, 5BP, 5ZS, 5BB, 4AW, 5ZM, 8AEZ, 9GY, 9ABD, 9ZN, 9EP, 9PC, 9HX, 9JW, 9WC, 9WG, 9AMI, 9CJ, 9TA, 6DM, 3HY, 3YW, 3TQ.

Stations outside 8 & 9 districts heard at 9GV—1VN, 1IZ, 1ZI, 2DG, 2AGJ, 2LK, 2PM, 2JD, 2PH, 2ABG, 2ATR, 3UF, 3NG, 3SQ, 3ZS, 3XC, 4CL, 4AA, 4AM, 5BV, 5DG, 5DU, 5BB, 5ED, 5AP, 5BJ, 5HP, 5AX, 5AM, 5CO, 5ZD, 5ZC, 5YG, 5ZM.

Of these the followini heard 9GV, 1ZL, 2AGJ, 2LK, 5BV, 5DU, 5BB, 5ED, 5BP, 5AX, 5ZM.

Mr. Kern also reports hearing 55 eights and 107 nines during December.

HEARD AT 8JA, Cleveland, Ohio.

1ZL, 2ZV, 2ABG, 2TL, 4AC, 4AA, 5BV, 8AEQ, 8AIR, 8OU, 8NF, 8ALM, 8NQ, 8VX, 8AAK, 9XN, 9RW, 9AGK, 9ZL, 9AGB, 9AEV, 9EV, 9EG, 9BA, 9JW, 9AAB, 9HX, 9AMI, 9YO, 9DV, 9GY, 9HQ, 9ABD, 9VY, 9TA, 9NN, 9GJ, 2ABG, 2JU, 2PY, 2UF, 5AX, 5ZM, 8NF, 8ALM, 8AOF, 8AKY, 8KT, 8AKJ, 8ARH, 8AKG, 8ZX, 8ZW, 8KS, 8EG, 8LB, 8ANG, 8ABE, 8KW, 9MQ, 8BJ, 9JB, 8AIN, 9ABK, 9GU, 9RW, 9DM, 9AHK, 9EP, 9AMY, 9ADP, 9PF, 9AU, 9AAR, 9PI, 9ZN.

Most distant amateur worked was 9JW Topeka, Kans., about 800 miles.

HEARD AT 2AGJ, ALBANY, N. Y.

1ZM, 1IZ, 1VN, 1EC, 1UU, 1ZL, 2LK, 2ABG, 2PM, 2JD, 2ZP, 2FS, 2JU, 3BD, 3SZ, 3ZS, 3AEP, 3TQ, 3RO, 4AA, 4CL, 4DI, 5BV, 8NH, 8JZ, 8AAK, 8XA, 8KF, 8JA, 8VP, 8AEH, 8OH, 8EG, 8VX, 8AEZ, 8YO, 8AKM, 8NG, 8NF, 8AOF, 8CO, 8YE, 8YI, 8ACW, 8KS, 8RS, 8QK, 8AKP, 8CL, 8ED, 8ZP, 8LK, 8AGR, 8AIR, 8CR, 8OU, 8ASG, 9ZN, 9GY, 9WG, 9LR, 9PC, 9VY, 9YO, 9NU, 9HQ, 9WO, 9CM, 9AAB, 9ABD, 9EG, 9GJ, 9DK, 9CS, 9ZI, 9JI, 9NN, 9IC, 9DC, 9ON, 9TA, 9JB, 9AU, 9JC, 9ACM, 9WC, 9BA, 9GU, 9UH, 9QR, 9HX, 9NW, 9AMY, 9ALD.

HEARD AT STATION 9MQ, OVER 125 MILES DISTANT.

9QN, 8AEZ, 9RD, 5QM, 9HQ, 9EM, 8CS, 9AKP, 5ZC, 8XO, 5ED, 9GY, 9GJ, KIK Denver, 9ABD, 9EG, 9RP, 5YG, 9AAZ, 8AOI, 9TR, 9HX, 5BV, 9BW, 9AHO, 9CP, 9MN,8YL, 5DC, 9UY, 9PC, 9LR, 9NN, 9FP, 9AGH, KIY Colo. Ass Colo., 5XO, 9YG, 9XV, 9YO, 8NH, 9AKP, 9AC, SN, 8NF, 5AD, 9AAB, 9JO, 9DV, 9DB, 9AIM, 9UH, 9AMI, 9MK, 9AHR, 8JY, 9HS, 5DU, 9FY, 9ALW, 9ANC, KIW Victor, Colo., 8XA, 9XN, 9XC, 9WZ, 9NW, 9NU, 9QF, 9ZI, 9ZS, 9ZF Denver, 9YI, 9YA, 9XQ, 9AGJ, 9UZ, 9ZL, 9VH, 9QF, 9ACM, 8JZ, 9ZO, 9AAU.

Heard at station 9EP, over 125 miles distant 9ZN, 9PC, 8CS, 9ZI, 5ZC, 9EM, 9AAU, 9CP, 8AEH, 5DC, 8ZW, 9GJ, 9LR, 9ZF, 4DG, 9VP, 9YD, 5AM, 9AKP, 8AEZ, 9HS, 9FW, 5AX, 8ARH, 9ABD, 9AHO, 8PA, 5ED, 9DK, 5BV, 8XA, 9WG, 9AAB, 9RD, 5DU, 9BA, 5BT, 5ZM, 9DV, 9MN, 8SK, 8UZ, 9DB, 9FS, 9PF, 8NH, 9AMO, 9JO, 8JA, 8AOF, 9EN, 5BB, 9NW, 9HX, 8YL, 9AHR, 9MK, 9FP, 9UY, 9YO, 9ZL, 9UC, 9TR, 8MB, 8OH, 9JI, 9AKL, 9BJ, 9EG, 5ZS, 9AMI, 9NN, 9PI, 8ASG, 5YG, 8NF, 9HQ, 9BW, 9IC, 9SY, 8YI, 9UK, 9AOU, 8CO, 8AFI, 9BN, 9VY, 9JB, 9WR, 9GY, 9LW, 9WH.

So far ths season the following stations have been received:
9HS, 9YA, 9YO, 9GJ, 9ZN, 9GY, 9ZN, 9ACM, 9OQ, 9IP, 9SP, 9ABD, 9TA, 9EG, 9WG, 9HQ, 9WO, 9LT, 9LR, 9IC, 9GR, 9BD, 9VY, 9HY, 9WC, 9RD, 9FP, 9XR, 9XC, 9XE, 9XD, 9XC, 9ZS, 9HX, 9NN, 9ME, 9UC, 9FW, 9AKP, 9TR, 9CF, 9AM, 9AMI, 9MQ, 9NW, 9LK, 9MY, 9AOF, 9AY, 9FP, 9LW, 9WU, 9BA, 9DB, 9DV, 9RW, 9YI, 9XA, 9YS, 9ALM, 8AEZ, 8NH, 8NF, 8JZ, 8JY, 8CX, 8PA, 8XA, 8CO, 8NY, 8ASG, 8KS, 8YL, 5AX, 5BV, 5BB, 5ED, 5ZS, 5ZC, 5ZA, 4AA.

Have worked with and heard by: 9DK, 9ME, 9BA, 9WU, 9LW, 9ZN, 9UC, 9ALM, 9AHO, 9FW, 9NW, 9HS, 9PF, 9ABD, 9AMI, 9VP, 8NH, 8AJM, 8CL, 5BV, 5BB, 4AA.—QSA.

So far have handled 19 messages.

Heard at Sheboygan, Wis., as follows: 1ZM, 2AGJ, 2PM, 5AA, 5DU, 5BV, 5XO, 5YG, 5ZC, 8AAK, 8AEH, 8AEZ, 8AIR, 8AEK, 8AOI, 8ASG, 8CI, 8CO, 8CS, 8IF, 8JA, 8JV, 8JZ, 8KS, 8NF, 8NF, 8NH, 8NQ, 8OH, 8PA, 8SK, 8XA, 8YO, 8YL, 8ZW, 9AAB, 9AAZ, 9ABD,, 9ACM, 9ADL, 9AGB, 9AHD, 9AHO, 9AKP, 9AKW, 9AOJ, 9AMI, 9AMY, 9AU, 9AZ, 9BA, 9CF, 9BD, 9DV, 9EG, 9EP, 9EY, 9FY, 9GE, 9GJ, 9GN, 9GY, 9HQ, 9HX, 9IC, 9IK, 9JI, 9JW, 9MK, 9MQ, 9NN, 9NU,

9ON, 9PC, 9PC, 9PF, 9PH, 9QV, 9RD, 9TA, 9UH, 9VY, 9WC, 9WF, 9WG, 9XD, 9XM, 9XR, 9YA, 9YI, 9YO, 9ZF, 9ZI, 9ZL, 9ZN, 9ZS, CR, HB, PY, WS.

Following is list of stations heard at 5BV between Nov. 1 and Dec. 11.

4AA, 4AT, 4DD, 4DG, 4DI, 5AM, 5AA, 5AX, 5BB, 5BT, 5CO, 5DU, 5EF, 5EP, 8AOF, 8AOI, 8ASG, 8CL, 8CS, 8CX, 8JY, 8JZ, 8KS, 8LJ, 8LT, 8NF, 8NH, 8OH, 8PA, 8UT, 9AAR, 9AAB, 9AAU, 9AAZ, 9ABD, 9ABM, 9ACE, 9ACM, 9ADW, 9AEG, 9AEV, 9AGB, 9AGH, 9AHA, 9AHO, 9AIK, 9AIM, 9AIT, 9AJ, 9AU, 9AW, 9BA, 9BJ, 9BL, 9BW, 9DB, 9DG, 9DH, 9DK, 9DV, 9DW, 9EG, 9EU, 9ED, 9FR, 9FW, 9GJ, 9GE, 9GR, 9GY, 9HQ, 9HS, 9HU, 9HX, 9IC, 9IF, 9ZN, 9IT, 9JI, 9JO, 9JS, 9JW, 9KG, 9LM, 9LW, 9LX, 9ME, 9MK, 9ML, 9MN, 9MQ, 9MR, 9NC, 9NE, 9NN, 9NW, 9ON, 9PC, 9PF, 9PI, 9PO, 9QF, 9QM, 9RD, 9RP, 9SD, 9SI, 9TA, 9UK, 9UH, 9UY, 9VH, 9VO, 9VP, 9VY, 9WF, 9WG, 9WI, 9WU, 5ZC, 5YG, 5ZM, 5ZS, 8XA, 9YI, 9YO

Have been heard at Brooke, Va Grove City, Va., 2AGJ, 2YM, 1ZM and 2PM.

HEARD AT 9ADL, MILWAUKEE, WIS.

9ABD, 9AAB, 9AIV, 9AGA, 9AMI, 9AMY, 9AHK, 9BV, 9BF, 9BS, 9BD, 9CE, 9CF, 9DB, 9EF, 9EM, 9EN, 9FK, 9GY, 9GV 9HL, 9HQ, 9IC, 9ZN, 9JC, 9JB, 9JI, 9JP, 9KU, 9KY, 9LX, 9LR, 9MM, 9MQ, 9MY, 9NN, 9NC, 9ND, 9NU, 9OM, 9OR, 9PC 9PK, 9RW, 9RP, 9RX, 9SP, 9TA, 9TK, 9UR, 9UT, 9VK, 9VY, 9WF, 9WC, 9XE, 9XM, 9XN, 9ZS, 8AAB, 8AEZ, 8JI, 8JX, 8JZ, 8NH, 8YO, 8XA, 8AOR, 7BD, 6EA, 5BV, 5DU, 5ED, 5ZC, 3AMP, 3RO, 2AGJ, 2AJG, 2IB, 1ZL.

If anyone hears 9ADL, I would consider it a big favor if they would drop me a card.

CLARENCE F. BATES,
2015 Wells St.,
Milwaukee, Wis.
(9ADL)

LIST OF STATIONS HEARD DURING DECEMBER 1916 AT 8NH.

1IZ, 1ZL, 1ZM, 2ABG, 2AGJ, 2AGM, 2BM, 2JD, 2JU, 2LK, 2PY, 2RD, 2RL, 2ZK, 2ZP, 3ATR, 3NB, 3UF, 3UD, 3ZW, 3XC, 4AA, 4CL, 4DD, 5AM, 5AX, 5BB, 5BI, 5BT, 5BU, 5BV, 5DU, 5ED, 5YG, 5ZC, 5ZM, 5ZS, 8AAK, 8AEH, 8AF, 8AFE, 8AFI, 8AGK, 8AIR, 8AKZ, 8AOI, 8ARE, 8ARH, 8BX, 8CL, 8CO, 8CP, 8CS, 8CX, 8CY, 8ED, 8EG, 8HJ, 8IQ, 8IV, 8JA, 8JG, 8JY, 8JZ, 8KI, 8KS, 8LE, 8LX, 8NE, 8NF, 8NN, 8NQ, 8NY, 8OE, 8PK, 8QK, 8TY, 8VA, 8VY, 8VP, 8VX, 8XA, 8YI, 8ZW, 8ZX, 8ZJ, 9AAB, 9AAR, 9AAU, 9ABD, 9ACM, 9ADW, 9AEG, 9AEV, 9AGB, 9AGH, 9AHO, 9AIK, 9AKP, 9AKD, 9ALE, 9AMI, 9AMY, 9AMT, 9BA, 9BJ, 9CP, 9BD, 9DC, 9DK, 9DL, 9DM, 9DV, 9EG, 9EN, 9EP, 9FF, 9GE, 9GJ, 9GY, 9HQ, 9HU, 9HX, 9IG, 9JB, 9JI, 9JW, 9KU, 9KV, 9LR, 9LW, 9ME, 9MN, 9MQ, 9NU, 9NW, 9QN, 9OY, 9PF, 9PI, 9RD, 9RP, 9RW, 9SX, 9UC, 9UX, 9UY, 9VM, 9VP, 9WC, 9WG, 9XN, 9YA, 9YI, 9YO, 9YS, 9ZL, 9ZN, BCH (Battle Creek), FD (Bristol, Tenn.) GRP.

HEARD AT 9ZN, CHICAGO, ILL.

1ZL, 2AGJ, 2LK, 2RL, 2JD, 2ABG, 2JE, 2NC, 3SZ, 3NQ, 3UF, 4TQ, 4CL, 4AA, 5ZC, 5BV, 5AX, 5DU, 5ED, 5ZS, 8NH, 8ACK, 8JZ, 8AEZ, 8OH, 8AF, 8JX, 8JA, 8AOI, 8CS, 8JY, 8KS, 8YI, 8ZL, 8XA, 8ZA, 8ZX, 8VP, 8CL, 8VX, 8LW, 8ZW, 8CO, 8YL, 8MW, 8YO, 9GY, 9ABD, 9PC, 9MY, 9NU, 9AMI, 9MQ, 9VY, 9UQ, 9AZ, 9EG, 9ACO, 9BD, 9AMY, 9AHO, 9AHK, 9BJ, 9PF, 9JI, 9BA, 9GE, 9BF, 9MK, 9RE, 9HQ, 9GS, 9QJ, 9NW, 9UH, 9FW, 9HX, 9ZL, 9ACE, 9AKP, 9NN, 9GJ, 9HS, 9RX, 9RD, 9EP, 9AAU, 9DK, 9JW, 9CP, 9AKT, 9WS, 9DM, 9DC, 9LR, 9ZR, 9ACM, 9SP, 9ZO.

Record transmitting distance during December was NRV, lying at anchor in Mobile Bay, who reports 9ZN signals very QSA on a silicon detector.

NRV also reports hearing 9DM, 9GV, 8YL, and several more.

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MONTHLY REPORT OF TRUNK LINES "C" and "D"

A. A. Hebert, Manager.

It has been decided to extend Branch Line No. 2, from Atlantic City, N. J., to Rehoboth Beach, Del., and the Branch now routes as follows:

PHILADELPHIA, PA.
3AEP—James F. Rau.
COLLINGSWOOD, N. J.
3NM—Geo. Haldeman.
ATLANTIC CITY, N. J.
3IF—Earle Godfrey.
ANGLESEA, N. J.
3UZ—Thos. W. Braidwood.
REHOBOTH BEACH, DEL.
3CY—? ?

Mr. J. O. Smith, (2LK) 47 Catherine Street, Valley Stream, Long Island, N. Y., has been appointed District Superintendent for the States of New York and Connecticut, and will have charge of all stations within that territory. All members on others interested within said district should communicate with Mr. Smith.

LINE "C"

NEWARK, N. J.
Put 2ALF. A. W. Manchee in place of 2AQ, D. N. Corson.

STAR STATIONS

3AEP, James F. Rau, Philadelphia, Pa.
4AA, W. J. Pope, Athens, Ga.
4AC, Elmer Rice, Jacksonville, Fla.

DISTRICT OF FLORIDA AND GEORGIA

John C. Cooper, Supt. Jacksonville, Fla.

Mr. Cooper reports that communication under favorable conditions has been established between 4AC, Jacksonville, Fla., and 4AW, Tampa, Fla., and between 4AC, and 4CL, Atlanta, also between 4AC and 4AA, Athens, Ga., 4AC has also worked 4DI, Winston Salem, N. C.

It therefore appears that traffic can be handled from Tampa to Athens, and thence to almost any point North, East or West, as 4AA has such a wide range.

During this month a test will be conducted between New York and Jacksonville over three different routes to find out which route is most available, and this should prove very interesting.

Three letters from Southern members addressed to Mr. Cooper are herewith quoted:

Athens, Ga., Dec. 26th, 1916.

I beg to acknowledge receipt of your favor of the 24th inst. relative to work done by stations in Georgia and Florida, and hasten to reply immediately.

I have worked the following stations this Fall and Winter so far:

4CK, 4DI, 4AC, 4AM, 8AEZ, 8NH, 8VX, 8XA, 8ALE, 8JA, 8QK, 8AEH, 8SK, 8QH, 8ZX, 8YO, 9PC 9WF, 9UC, 9ABD, 9PI, 9VY, 9ZL, 9GY.

I have had the following acknowledgement from those who have heard me:

8YI—3AFA—8CS (Saginaw, Mich. reports hearing me constantly for the past two months very loud and clear.) 9AU—9AQ—4BY—4BC—4CA—5XM.

The following stations have been heard at 4AA this Fall and Winter, using single Audion-Tron and short wave tuner:

9YI, 5YA, 8YA, 8ZX, 5ZH, 8YO, 5ZC, 9XE, 9YA, 9YO, 8YL, 9ZL, 5ZM, 1ZL, 8YI 9XR, 8XW, 8XA, 2JA, 2JU, 2AGJ, 2CB, 2LK, 3RO, 8UF, 8MF, 8QK, 8OH, 8AGF, 8AMY, 8LR, 8IK, 8AAK, 8CK, 8ME, 8AMF, 8AEZ, 9VY, 9LR, 9WF, 9ABD, 9NN, 9JB, 9PI, 9MQ 9IO, 9CF, 9AU, 9BD, 9ME, 9NQ, 9IK, 4CK, 4DI, 4AF, 4AC, 4EI, 4AW, 4AG, 5ED, 4AM, 5BV, 5DU, 5BB, 8BK, 5AX, 5AP, 8AOH, 8ALE, 8AMG, 8JW, 8AEH, 8JB, 8ACK, 8NH, 8ET, 8VX, 8JA, 8NF, 8ASG, 8JK, 8JZ, 8NQ, 8CS, 8HQ, 8AL, 8CL, 9DS, 9NQ, 9PC, 9GU, 9AGC, 9BA, 9MZ, 9MK, 9UK, 9KG, 9JG, 9ACM, 9GJ, 9UC, 9AEW, 9AEG, 9WG, 9IM, 9HK, 9ON, 9AAB, 9DK, 9DB, 9JI, 9HQ, 9JW, 9FY.

In put to transformer at any time this winter has not exceeded 350 Watts. Coupling on oscillation transformer loose.

For my location and with all of my receiving set home made and rather loosely connected up on account of constantly changing for experimental purposes, the above is a pretty good bunch of stations to be heard. Some of the above are heard only at infrequent intervals but the majority of them are heard regularly when conditions are fairly good.

The weather has been extremely unfavorable for radio work for the past week or ten days, there being a great deal of static most of the time and many stations heard coming in mushy and not clear and sharp as they do in good weather.

I worked 5AM at Birmingham recently at a few minutes after six p. m. Eastern Standard time, but lost him quickly on account of his fading.

The gaps we face to be bridged in this section are simply unheard of with the fellows west, north and east, excepting of course the extreme west, there conditions are much more favorable than here in the south, I understand.

I am frank to state that we are going to have a hard time doing any relay work to amout to anything until we get more stations to fill in the long gaps.

I get 4AC quite strong when conditions are good, but QRM on his wave is something terrific, especially from 9ABD who simply smothers him completely and makes work absolutely out of the question.

I hope we can accomplish a great more from now on until spring than we have done so far.

Wishing you a Happy and Prosperous New Year, I beg to remain, Sincerely yours,

(Signed) W. J. POPE."

Mr. P. H. Wall, (4AW) Tampa, Fla., reports having communicated with the following stations:

4BW, 4CD and has heard the following: 4CK, 4AM, 4AA, 5BV, 5BB, 5AX, 5AP, 8AE, 8NH, 8AZ, 5ZC, 9YW, 9VY, 9NW, 9WF, 9ABD, 9BA, 9MQ, 9ME, 9UC, 9JI, 9HX, 9GL.

Mr. ELMER RICE, (4AC) Jacksonville, Fla., reports workng with 4AA, 4AW, 4CL, 4DI, and has heard the following: 2JU, 8SZ, 4AM, 4DD, 4DG, 4DI, 5AM, 5BV, 5DU, 5ED, 5ZC, 5ZM, 8CO, 8JA, 8NH, 8XA, 8YL, 8YO, 8ZX, 8AEZ, 9BA, 9GJ, 9UC, 9VY, 9ZL.

DISTRICT OF VIRGINIA AND NORTH CAROLINA

Mr. W. T. Gravely, (3RO) Danville, Va.

Mr. Gravely reports that there is not much to say at this writing as the stations in his section are not doing very much, 3SZ has been recently tuned down to 200 meters by the Radio Inspector, and is now radiating less than one ampere. 3WE (Roanoke), will soon be on with his ½ kw set and as soon as his Rotary Gap arrives. Nothing has been heard from Richmond.

3RO, Danville, Va., heard the followng stations during the month of December: 1DK, 2ABD, 2IG, 2JD, 2JI, 2LK, 2RL, 3AI, 3CK, 3NK, 3ZW, 4AC, 4DG, 5DM, 5MS, 5ZM, 8AEH, 8ASG, 8AEZ, 8AH, 8AX, 8ALE, 8CS, 8CL, 8CI, 8AWA, 8FR, 8KS, 8JZ, 8ZK, 8NH, 8XA, 8YI, 8JI, 8OH, 8JG, 8VP, 8IK, 8JY, 9UC, 9EG, 9VY, 9NY, 9EP, 9PC, 9WG, 9AX, 9JI, 9UH, 9ABD, 9AIK, 9DK, 9AL, 9GO, 9SD.

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DISTRICT OF NEW YORK AND CONNECTICUT

Mr. J. O. Smith, (2LK) Superintendent, Valley Stream, Long Island.

Mr. Smith's report is so interesting that same is quoted herewith in full:

"Great advance in efficiency and reliability of service were made by the stations in this district during the year just closed, and especially during the last half of it. Through the efforts of the League Officers and a number of the best stations, a reliable and accurate service for handling relay message work has been built up and more regular traffic has been handled the past year than in any other year in the history of amateur radio.

There have been amateur stations handling messages, of course, for a long time, but in an unorganized, uncertain way. This year, especially, through the efforts of the various district managers and superintendents, this force of amateur radio stations has been organized into a dependable whole and the amount of traffic handled and the accuracy and promptness with which this has been done is gratifying beyond description to those who have the real interest of amateur radio at heart.

The regenerative sets now coming into general use have been a great factor in the increased efficiency of many stations, and a better understanding of the possibilities of a sending outfit of even small power when properly tuned have also been a great step toward greater efficiency.

A lot has been accomplished in the past year, but a lot remains to be done. The amateur who will not recognize the benefit of organized effort, or who does not grasp its true meaning, is, unfortunately still with us.

The second district contains over 1,000 licensed stations most of whom are situated within a radius of fifty miles from the center of New York City and the consequent interference makes it impossible to do satisfactory long-distance work until after midnight. It is not at all an uncommon thing to hear some of the Star relay stations keep working on long distance traffic until approaching daylight puts an end to it.

During December the bulk of the through business in this district has been handled by stations 2ABG, 2ZP, 2AGJ, 2BO and 2LK, also via the Hudson River route, 2CE, 2DA, 2BM and 2AGJ. The trunk lines between New York and the West have, in fact, been in such good shape that messages have frequently been handled and delivered on a twenty four hour schedule been New York and Chicago, both ways. Station 2AGJ handled forty-two messages in one night. During the last half of the month considerable traffic was handled direct between 2ABG, 2LK and 9ZN and 9GY.

Communication with points South is not yet in dependable shape, although some traffic has been handled between Second District stations and 3ZW and 8ZW.

The writer hopes that by the time this issue of QST reaches its readers that a dependable and prompt relay service will have been established between New York and New England. At the present writing it is not possible to get traffic through to New Haven, Hartford, Worcester, Boston or other points, except at rare intervals. This condition must of course be remedied as soon as possible, altho the undoubtedly natural obstacles to successful working over this particular territory, have been known to radio operators for years, so that the difficulty will be no

mean one to overcome.

A New branch line running the length of Long Island is being organized and it may be possible to get into Connecticut that way. Exact details, including the stations selected, will be published in a later issue.

It is also intended to organize a new line through the center of New York from New York City to Buffalo, which will take care of parts of the state not now touched.

A new plan has been tried out in Brooklyn, where 2BO has been made the central collecting and distributing point for all Brooklyn traffic, and the arrangement has so far worked out very well. A similar arrangement will also be made at other points such as New York City later on."

To the foregoing your manager gives below some of the traffic handled by stations which have been doing unusually good work during December:

2LK, sent 100 and received 101 messages —the long distance work was carried on with 1CM, 1ZD, 3ZW, 8YL, 8ZW, 8VX, 8YI, 8JZ, 8NH, 9GY, 9ZN.

3WN, is our old reliable between New York and Philadelphia and handled 66 messages during the month, and is to be commended for his daylight work with 3AFA.

2ABG is another good worker and has to his credit for December 203 messages— Long distance work with 2AGJ, 8KK, 8JA, 9ABD, 9ZN, 1ZD, 8ALE, 8QK, 8CO.

For the past two weeks a great deal of QRM has been occasioned by some harebrained individual in this vicinity "sitting" on his key the whole evening, making it impossible to do any kind of work with distant stations. Our members are on the watch for the individual, and if found it is our intention to make an example of him.

Trunk Line "D" insofar as real good relay work is concerned is practically dead, due mostly to so many of the stations not properly equipped. We are now looking over the field to find a good member, one who is desirous of working hard, and offer him the position of District Superintendent for the State of Pennsylvania, feeling that one on the ground will be able to accomplish much more than has been done in the past.

No other complaint can be made, as the members are certainly showing their loyalty by doing good work and offering good advices.

This counts a great deal to the officers of the League, and brings one more thought to the mind: DO NOT FORGET YOUR DUES AND SUBSCRIPTION TO QST.

ARTHUR A. HEBERT,
246 Highfield Lane,
Nutley, N. J. 2ZH.

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Don't Throw Them Away Any More

Here is a new one. It comes to us from Oberlin, Ohio, from Mr. H. Gould, whom we know better as 8QK. That the scheme works is proven by the fact that we hear him QSA here at Headquarters in Hartford, Conn. He keeps all his old run out dry cells and takes off the paper coverings and connects them together on a long wire, all zincs together, and buries them all over the lot. He gets a ground which is a good one if the soil is anywhere nearly moist.

When we think of the dozens, yes, gross, we have chucked in the ash barrel we have a qualm. Why did not 8QK come across with this idea before? When the "OLD MAN" reads this he will probably sit up and take notice as we understand "Grounds" is one of his "rotten" pets. Keep your old dry cells from now on.

OUR COVER

Take a QTA at our cover this time. Notice the new style. We think it is very true to life and notice down in the corner who drew it. Mr. Ferris, 8AOZ, submitted this one to us. We did not know we had such wonderful artists in our ranks. Perhaps other readers have some ideas which they would like to see on the front of QST. If you have any kind of a cover idea and closely connected to it an artistic ability, try a hand at it. We'd all appreciate it and it brightens up our QST. By the way, did you QRK the cover which Mr. Hick drew for January ?

THE DANGER SIGNAL UP

Word comes to us that another RELAY ASSOCIATION is in the making. The intention is said to be to establish competing Trunk Line Relay Systems like our own. Our own members will be asked to join it on some pretext or other. A coast to coast or some other kind of a grand stand play is said to be contemplated in order to gain publicity and give the thing a start. Probably a pennant and a button will also be held out as an extra inducement, under the impression that these things appeal to us amateurs.

We see danger lurking behind all these movements. There should not be too many relay associations, leagues, organizations, etc. There is not room for them. They will produce jealousy, animosity, and bad feeling, and the very first thing which will follow the arousing of such feelings, will be "willful interference." The minute this begins, the Government will take a hand and judging by what we have just seen in Washington with our own eyes, we have reason to believe that if Uncle Samuel is compelled to take a hand with us amateurs, it will be a very heavy hand. These are no idle words. We know whereof we speak. For example;—Our friend 5ED down in Houston, Texas wants his station license renewed when it expires in the near future. He tells Mr. Matthews, on whose Trunk Line he is, that he is informed his license will not be renewed, probably for no reason that he is responsible for. Mr. Matthews appeals to us to save one of the good stations in one of his important Trunk Lines. We take it up with the proper Federal authorities, and the result is the following which is an extract from a letter to Mr. Maxim:—

"I respectfully inform you that by order of the War Department, this office cannot issue or renew amateur radio station licenses south of Austin, Texas——. In connection with this matter, I wish to state that I was very much disappointed in the behavior of the amateurs in that vicinity and sincerely hope that this will be a lesson to the amateurs, in general, for the future. I AM CERTAIN THAT THE WAR DEPARTMENT WOULD HAVE NEVER TAKEN SUCH ACTION IF IT WERE NOT ABSOLUTELY NECESSARY. I AM INTERESTED IN THE WORK OF YOUR LEAGUE AND TRUST THAT AN

OCCASION OF THIS KIND WILL NEVER AGAIN OCCUR."

The capitals are ours. Here we have "the handwriting on the wall," and fellow amateurs, seriously speaking, we must watch out carefully about getting into quarrels amoung ourselves. There will not be much to Amateur Wireless in these U. S. A. if we once arouse the Government. There will also not be much in the business of manufacturing apparatus for us if we misbehave. We positively must manage somehow to maintain PEACE among ourselves, and before we join other associations or do anything else likely to lead to quarreling, let us think twice.

SHORT WAVE TRANSMITTERS

We preached, efficient short wave receivers. Lately, our efforts have taken a similar turn and we have been crying for efficient short wave transmitters. We can remember the time when there were no short wave receivers for sale, so we feel that our efforts had something to do with the advent of this latest piece of apparatus. Again, we look forward and advocate a short wave transmitter. Our receiving apparatus has reached the stage necessary for efficient relay work. On the other hand, many of our transmitters are lagging behind and getting out of phase. How long will it be before some of the worthy manufacturers will commercialize our idea?

To crystallize this idea, we shall state more definitely this latest problem. We relay stations need efficient transmitters which will work on short wave lengths. With the present-day apparatus, we can get efficiency if we work hard enough to get our set just right. But to do this, we have been obliged to purchase a rotary here, a transformer there, a condenser somewhere else and the oscillation transformer comes from still another direction. Why does not some manufacturer combine the apparatus, design it for short leads, and put it together so we can buy a sending set which will have an efficiency worthy of comparison to the short wave receiver?

We might advance still further and it is very possible that some type of impulse excitation could be used. Up to this time, most of the excitation transmitting has been carried on with direct current. It is possible, however, to develop a type of rotary gap which could be used with some other apparatus which would develop an entirely new sending set. How long will it be before our call is answered?

OUR QST FAMILY

This little family of amateur radio bugs is certainly a very happy one. From the letters we have received since the January issue, we feel that we might have to enlarge the dining room table pretty soon. Even our Editorial Rooms are beginning to show signs of living in. Observe that we said "Rooms." We have moved into another suite, as we have added one more closet, we have hopes that we might soon begin to resemble the picture which heads this dignified Department. One thing, however, is changed. We shall have to put in a third figure because there are three of us now. We thought when the third one arrived, that we might drop this typewriter business long enough to listen in on the Big Trans-continental, but we know if we stop, this copy will be late, and then there will be trouble at the printers. Our QST family reminds us of QRM. It is growing all the time, but unlike QRM, it grows too slowly to suit us. We have reached the mighty number of five thousand, but our advertisers are trying to have this doubled. And say, we could double it over night if every one of us would get one more to come in and join the family. Some of us might get two, and this would make up for those who do not get any. Every two means QST can be made that much better because it will give us that much more money to work with. We feel we have the "know-how," but we do not always have the money. Why not try and keep this in mind, all of us! Begin today. Two fellows, two coupons. Two dollars. Two cent stamp. The job is done.

OUR COVER

Take a QTA at our cover this time. Notice the new style. We think it is very true to life and notice down in the corner who drew it. Mr. Ferris, 8AOZ, submitted this one to us. We did not know we had such wonderful artists in our ranks. Perhaps other readers have some ideas which they would like to see on the front of QST. If you have any kind of a cover idea and closely connected to it an artistic ability, try a hand at it. We'd all appreciate it and it brightens up our QST. By the way, did you QRK the cover which Mr. Hick drew for January ?

THE DANGER SIGNAL UP

Word comes to us that another RELAY ASSOCIATION is in the making. The intention is said to be to establish competing Trunk Line Relay Systems like our own. Our own members will be asked to join it on some pretext or other. A coast to coast or some other kind of a grand stand play is said to be contemplated in order to gain publicity and give the thing a start. Probably a pennant and a button will also be held out as an extra inducement, under the impression that these things appeal to us amateurs.

We see danger lurking behind all these movements. There should not be too many relay associations, leagues, organizations, etc. There is not room for them. They will produce jealousy, animosity, and bad feeling, and the very first thing which will follow the arousing of such feelings, will be "willful interference." The minute this begins, the Government will take a hand and judging by what we have just seen in Washington with our own eyes, we have reason to believe that if Uncle Samuel is compelled to take a hand with us amateurs, it will be a very heavy hand. These are no idle words. We know whereof we speak. For example;—Our friend 5ED down in Houston, Texas wants his station license renewed when it expires in the near future. He tells Mr. Matthews, on whose Trunk Line he is, that he is informed his license will not be renewed, probably for no reason that he is responsible for. Mr. Matthews appeals to us to save one of the good stations in one of his important Trunk Lines. We take it up with the proper Federal authorities, and the result is the following which is an extract from a letter to Mr. Maxim:—

"I respectfully inform you that by order of the War Department, this office cannot issue or renew amateur radio station licenses south of Austin, Texas——. In connection with this matter, I wish to state that I was very much disappointed in the behavior of the amateurs in that vicinity and sincerely hope that this will be a lesson to the amateurs, in general, for the future. I AM CERTAIN THAT THE WAR DEPARTMENT WOULD HAVE NEVER TAKEN SUCH ACTION IF IT WERE NOT ABSOLUTELY NECESSARY. I AM INTERESTED IN THE WORK OF YOUR LEAGUE AND TRUST THAT AN

OCCASION OF THIS KIND WILL NEVER AGAIN OCCUR."

The capitals are ours. Here we have "the handwriting on the wall," and fellow amateurs, seriously speaking, we must watch out carefully about getting into quarrels amoung ourselves. There will not be much to Amateur Wireless in these U. S. A. if we once arouse the Government. There will also not be much in the business of manufacturing apparatus for us if we misbehave. We positively must manage somehow to maintain PEACE among ourselves, and before we join other associations or do anything else likely to lead to quarreling, let us think twice.

SHORT WAVE TRANSMITTERS

We preached, efficient short wave receivers. Lately, our efforts have taken a similar turn and we have been crying for efficient short wave transmitters. We can remember the time when there were no short wave receivers for sale, so we feel that our efforts had something to do with the advent of this latest piece of apparatus. Again, we look forward and advocate a short wave transmitter. Our receiving apparatus has reached the stage necessary for efficient relay work. On the other hand, many of our transmitters are lagging behind and getting out of phase. How long will it be before some of the worthy manufacturers will commercialize our idea?

To crystallize this idea, we shall state more definitely this latest problem. We relay stations need efficient transmitters which will work on short wave lengths. With the present-day apparatus, we can get efficiency if we work hard enough to get our set just right. But to do this, we have been obliged to purchase a rotary here, a transformer there, a condenser somewhere else and the oscillation transformer comes from still another direction. Why does not some manufacturer combine the apparatus, design it for short leads, and put it together so we can buy a sending set which will have an efficiency worthy of comparison to the short wave receiver?

We might advance still further and it is very possible that some type of impulse excitation could be used. Up to this time, most of the excitation transmitting has been carried on with direct current. It is possible, however, to develop a type of rotary gap which could be used with some other apparatus which would develop an entirely new sending set. How long will it be before our call is answered?

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WHERE ARE WE BOUND?

Has it occurred to any of you fellows where this relay message traffic is likely to lead us? It is one of the subjects we frequently get onto around the table here at Headquarters when we talk things over. What is it all going to end in? Here we are, some five thousand amateur wireless operators, engaged in handling real traffic every night in the week. Some stations handle twenty or thirty messages in a single night. They give up four or five hours of good hard work at the key receiving and transmitting messages from every part of the country. Their operating room looks like a real telegraph office, and they work like real telegraph operators. When you see them with their sleeves rolled up, and the inevitable pipe smoldering away, and the messages coming in and going out in a steady stream, it makes you stop and think.

And all this work is independent of all financial remuneration. It is done absolutely and simply for the fun of the thing. And we are not all young men who do this. Many of us are the heads of families with sons who take their trick at the key also. Some of the stations represent investments of close to $1,000, and nothing which will improve efficiency is too expensive to buy, in the case of a surprisingly large number of it.

If the Government continues its policy of paternal encouragement to us amateurs, there is no telling where we will go. We already have receiving apparatus a long way in advance of the average commercial receiving equipment. We do not think anything at all of communicating one thousand miles with a power input of one kilowatt or under, and a wave length between two hundred and three hundred meters. Twenty or thirty of us do this thing every night in the week. We wonder if a general communicating system will develop whereby the private citizen will be able to communicate with any other private citizen a long distance away without its costing anything? We wonder if individually owned and operated amateur wireless stations will have an effect upon long distance telephone business? If it does, we wonder what the American Telephone & Telegraph Company will think about us? We wonder if the ever increasing demand for amateur apparatus will lead the manufacturers to develop more and more sensitive apparatus until all of us easily hear Honolulu, Japan, South America and Europe? We wonder if new and valuable patents on short wave apparatus for amateur use will develop and alter the existing patent monopoly on wireless manufacturer? We wonder if the tremendous industrial advantage which our country will enjoy if the amateur is encourged will lead foreign countries to modify their rigid suppression of the amateur wireless operator and eventually end in its being possible for us amateurs here in America to "work" amateurs in foreign countries? And last of all, we wonder if you and I some night in the future will sit in our little room and chat with another fellow in Germany or France while we listen to what is going on between a couple of fellows, one in Brazil, and the other in Honolulu? We realize this last is a pretty good "wonder" but if we advance as much in the next ten years as we have in the past ten, it will be something to confidently expect.

QRM CONTROL

There is no use talking, we must get busy on this QRM business. Every mail brings in letters telling about the absolute stagnation of traffic on account of this nightmare known as QRM. We have discussed it here at Headquarters a great many times, and a great many good ideas have come to the surface. Our President has for some months been giving a lot of his attention to the subject and at the present time, is awaiting the setting of dates when he is to have a hearing before the authorities in Washington. We understand that there is a possibility of introducing into the new law something which will lead to better control of QRM. This strikes us as likely to start something. It cannot be any worse than it is at the

present time.

The law is explicit in saying that we must transmit on a wave not exceeding 200 meters, that we shall have a pure wave to the extent that no subsidiary wave shall have an amplitude greater than ten per cent. of the main wave, and there is a pretty square toed remark regarding a decrement not greater than two-tenths. Of course one kilowatt power input is our limit, but this is the least of our troubles because the chief QRMers use considerably less than one k. w. The big noise which bothers us if we sit up late enough is the fellow with the impure wave and the big decrement. His spark comes in any where between two hundred and five hundred meters, and he cannot be tuned out any more than turning over in bed will tune out the Thomas cat in the backyard. And this fellow invariably is one who is not satisfied unless he is pounding his key every blessed minute of the time. An enforcement of the law would be a good thing in his case, but the great trouble is he is anywhere from one hundred to five hundred miles from the District Radio Inspector and the latter never hears his catawauling and we, like a lot of dubs, hesitate to complain about him.

Another great thorn in our flesh is the matter of BREVITY. Our grouchy old friend, THE OLD MAN, hits the nail on the head on this subject. Too many of us spiel too much. We ring in "Say OM how is the skating up your way," or "Say OM how are things anyway," or "Say OM how are you and what is the news down your way." This sort of thing is all right if no one else wants to listen or work, but when there are twenty or thirty who want to listen or have messages to get through, it makes it very awkward to say the least. The law says something about "unnecessary signalling," and it also uses threatening language about interfering with interstate traffic. If you are trying to get something from somebody over in the next State, and you fail to be able to get it because of the fellow who wants to know how things are, is the latter not guilty of interfering with interstate traffic? It seems to us there is at least an argument here. In other words, if we organized our selves together and agreed to report cases of unnecessary infractions of the law, would it not bring about better conditions? Of course, it might be said that the other fellow can come back and say that our relaying is unnecessary. If it is, then we must accept the responsibility and we will soon learn to only transmit what is reasonably necessary. We ought to not have much trouble in proving that handling relay traffic was reasonably necessary. In any event it is less unnecessary than idle conversation.

We have a suggestion recently from one of our good stations, which strikes us as being very much to the point. This is that we arrange to have certain of our best station owners appointed DEPUTY INSPECTORS. Clothed with this authority they would be in a position to report favorable and unfavorable conditions to the District Radio Inspector and the latter would under the law, be virtually compelled to notify the transgressor that he must "not do it again." A letter from a District Inspector warning us that we must not repeat certain practices, would be something which would be taken seriously every time. We think it would be a very good idea if our members would write in to Headquarters what they think about this plan, or any other which beats it.

ENTHUSIASM

Somebody told us once that the thing which put the pep and hustle into things was ENTHUSIASM. The old fellow was right. When we see our relay stations operating far into the night, handling relay traffic, and doing it all from ENTHUSIASM, we appreciate what a lot of horse power there is in this same mixture. In order to get away from the local QRM, most of our good relay stations do not begin operating until an hour or so before midnight. They keep it up until two and three o'clock in the morning. So as to be fit for publication, the next day, these fellows go to bed along about seven o'clock and get three or four hours sleep. And they keep it up and enjoy it and build up reputations for themselves and for the

American Radio Relay League. No wonder we grow and advance and get stronger every month.

Another indication of this wonderful ENTHUSIASM is the article by Mr. Vermilya which begins in this issue. That our efforts should so inspire Mr. Vermilya that he is led to write such an extremely interesting and amusing article, shows that the thing is contagious. Mr. Vermilya is no less a person than the Manager of the big Marconi station at Cape Cod, known all over the East as "Cape Cod," or WCC. This makes us appreciate a fact that we frequently overlook, which is that the gulf between the COMMERCIAL and ourselves is not such a yawning chasm as it seems to be, because it was only yesterday that these self-same commercials were amateurs. Keep up your enthusiasm, fellow bugs, and we will have the strength to perform miracles.

MENTION QST

Do any of you write to our advertisers? This is something every one of us ought to consider a part of his job in our mutual efforts. As you have all noticed, our advertising columns have become extremely interesting and instructive reading matter. The different apparatus illustrated and described represents a profoundly vast amount of work on the part of those people who are making it their business to help us. Incidentally of course, they earn their living doing this, but this does not alter the case that they are leaving no stone unturned to produce for us the best that brains and money can produce. These gentlemen, on the other hand, pay us good money for the privilege of showing us their apparatus in the pages of our magazine. Therefore, to make the deal a square one, we must look at our advertising columns in just a little different light than we look at the advertising columns in other magazines. Think about this, fellows, when you look through our pages and whenever you see anything which you think interests or might interest you, make an effort to remember to write a postcard to the manufacturer and ask him for additional information and before you finish, make a special point of **MENTIONING QST.** This backs us up when we ask him for another ad and it is good all around team play in addition.

Concerning Poles for the Amateur

Continued from page 19

The cost of the two towers erected and painted was only slightly over $500.00. With present prices for material and labor, it would be considerably higher. It will also be higher if you try to get someone else to erect it for you than yourself—I had one contractor make me a bid—just to erect them—of $997.30. Now the main point of this article is this—any amateur with a little horse-sense can put up a tower as high as he wants it, and for far less expense than one would at first believe possible.

*****

Who was the first wireless man to transmit without a spark?

Why Noah, of course, when he commenced sending from the Ark!

Department of Defence

Continued from page 21

ens. As soon as the outcome of the battle with the Persians was certain, Philipidist, the greatest runner among the Athenians was dispatched to Athens. After his arrival at the city, and after he had given the joyful news to the inhabitants, he fell dead.

Paul Revere's ride has a place in our national history dear to the heart of every American. It marked the opening of the actual struggle of the Revolution.

The speed with which the news of the successful completion of the Erie Canal was transmitted from Lake Erie to New York amazed the world of that day. It was relayed by the sound of cannon, which had been placed at intervals from one end of the canal to the other.

Perhaps in the future, the American Amateur will make his mark in history.

WHO'S WHO IN AMATEUR WIRELESS

We shall publish each month two pictures of amateurs who have become known by call letters. This will draw us all closer together. We are often curious as to just what the other fellow looks like, and here's our chance to see.—Editor

Phillip H. Gilbert, 6AAG

Mr. Phillip H. Gilbert, 6AAG, of Pomona, Cali., has been in the amateur wireless game for nearly five years, during the latter half of which he has become prominent for his long distance work, so much so that his signals are quite generally used as a unit of comparison when discussing the strength of distant signals.

At present, Mr. Gilbert is acting as an alternate with 6EA for handling the relay work at Los Angeles and the combination is hard to beat.

Becoming personal, Mr. Gilbert is nineteen years of age, a graduate of Ponoma High School and an enthusiastic Relayer.

Hiram Percy Maxim, 1ZM

Another interesting member of our "Who's Who" has been added this time. This is Hiram Percy Maxim, 1ZM, the President of The American Radio Relay League. He has devoted a great deal of attention to the amateur wireless field. One of the results has been our efficient Trunk Line System.

During the past few months, his station, 1ZM, has been gotten into fine working order. More than one of us have heard his spark, and we shall all be glad to see his picture. We all know him but perhaps this has been the first opportunity of meeting him.

First Trans-continental Relay Fails

AS a record for future generations to smile over, we herewith print the story of the first attempt to run a message from the Atlantic to the Pacific and get an answer back the same evening. As the message would have to run across one of Mr. Matthews' Trunk Lines, he was selected as the one to put in charge of the job. He finally settled upon the night of January 4th, 1917. If we failed, we were to repeat it the next night. Very perfect detailed arrangements were worked out, and military discipline required. The arrangements were as near perfect as anything could be, provision being made for every contingency, except the one which happened, and which human knowledge at this date cannot surmount.

A pilot message was to go at 12:20 a. m. At 12:30 the real message was to follow. The starting point was, the station of our President, 1ZM, at Hartford, Conn., and the Pacific terminal was at Hoquiam, Wash., the station of Mr. Henry W. Blagen, 7DJ. The Hartford Courant was to ask a question of the Grays Harbor Washingtonian at Hoquiam, and the latter was to answer this question. The question and the answer were previously exchanged by the newspapers by mail, and kept secret so as to place the honesty of the transmission beyond question. Post cards asking amateurs to QRT between 12:30 and 4:00 a. m. on the nights of January 4th and 5th, were sent out and the fellows apparently observed them scrupulously, for which the managers express deep appreciation.

At 12:15, the night of the 4th, the representative of the Courant handed Mr. Maxim a sealed envelope containing the secret question. He did not open it but waited until 12:20, when he started the pilot message. 2AGJ was heard to immediately hand it on to 8NH and it seemed as though the machinery so long preparing was going to work perfectly. At 12:23, 2AGJ was heard sending a query to 8NH. At 12:25 he sent another. At 12:27 he sent still another. This indicated something was wrong between him and 8NH. At this moment, Mr. Maxim broke the seal of the envelope containing the message, because it was to go on time regardless of anything. At precisely 12:30:00, Western Union time, he started the message. Immediately he finished it, 2AGJ acknowledged its receipt and started it to 8NH. At 12:37 he had finished it. At 12:40 he queried 8NH. He continued querying for several minutes, and then reported back to 1ZM first he could not hear 8NH. Then began the struggle. Other stations were called, CQs were sent out, and every conceivable effort was made to raise 8NH or 9ZN at Chicago. Not a single Eighth District or Ninth District station could be raised. The QRN was terrific, and the QRM nil. It was evident that the first attempt was going to fail. It did, and just as the forms for this issue of QST close, we have the stories of most of the different stations. They are sad tales of the vicissitudes of radio communication in this year 1917.

Listen to the story of 2AGJ first. Most of us west of the Mississippi know him well by radio. He handled his part as perfectly as any one could:—

"Yours received and here goes: I copied message from you both nights O. K. without trouble. Sent it to 8NH immediately and heard her come back with a faint QTA the first time, so sent it again. Did not receive any QSL or hear her again after that. In fact, I did not hear another western station that night. Friday night, I could not raise 8NH or 9ZN or anybody else in fact, on a CQ. I did not hear any western station again at all. On Saturday night, I called 8NH and did not hear her at first, but finally got the message to her O. K. Just received letter from her and believe me, we must have had some freaky radio weather when she couldn't even read me.

I have been handling traffic direct with 9GY at Mattoon, Ills. and in his last letter he told me he could read me with the phones on the table using a single bulb. So you see, something was very, very wrong with the air. I surely am sorry, but you know I did my best. I will bet she goes through the next time PDQ. My spark must be pretty good because I have just received a letter from the operator on ss Mexico, KWX, running between New York and Havana, and he says he gets me regularly all the way down and all the way back with a single bulb. 73 2AGJ."

The next is the harrowing tale from Mrs. Candler at St. Mary's, Ohio, 8NH. She says: "On Thursday night the static was so strong that I could not possibly read 2AGJ. In fact, I could hear only a very few of the very strongest stations, but could read none of them. The data I give below refers only to those stations which exceed one hundred and fifty miles distance from here, and covers the entire night. On Thursday night, I could not hear a single southern station and only a very few of the very loudest of those to the west, east and north of me. This I suppose was due to the terrific static; but please notice the peculiarity of the two following evenings when static had subsided enough so that almost any station of average intensity could be read if heard.

On Friday night, stations east, west and north of me could not be heard at all. Stations to the south of me and southwest roared in. The dividing line between stations which could be heard and those which could NOT be heard, seemed to pass straight across the country about on the fortieth parallel.

On Saturday night, this was repeated even to a more marked degree, except for a short interval, just after our midnight, during which time I was able to read 2ABG and 2AGJ. 8JA at Oberlin, Ohio and 8IK at Columbus, Ohio, who were listening in, reported the same thing to me, so that I know it was not a freak of my audion, or my set. The southern and south western stations were even louder than they were on Friday night. 5DU at Dallas, Texas, was so loud he could easily have been read through any of the nearby stations including 8AEZ at Lima, Ohio, close by. I could hear stations as far west as Denver, Colo., but not a single station to the north.

As Friday night had brought us no results in the great relay, and as the early part of Saturday night brought nothing better, I was beginning to fear a repetition of the failure, but kept asking for repeats thinking perhaps 2AGJ might come in by and by. Again, no station north of the fortieth parallel could be heard. Finally, just as I was about to give up all hopes, I heard 2ABG call 2AGJ. I decided immediately to break the rules sent us, and so called 2ABG and asked him if 2AGJ at Albany was really sending the message and if so, would he, 2ABG, at Yonkers, N. Y., give it to me since I could not hear a signal from 2AGJ. 2ABG immediately answered and gave me the message which I then immediately forwarded to 9ZN at Chicago, whom I could not hear but whom I hoped might hear me. I waited for his O. K., and getting none, sent it to him a second time. After finishing, 2ABG at Yonkers, called me again and said that he had heard 9ZN at Chicago O. K. the receipt of the message.

Just at this time, signals from 2AGJ began to come in, and for a while became quite strong. He could be read for something like an hour and then gradually disappeared, and we could hear him no more for the rest of the night. I stayed on until 3:30 a. m. Central Time in case of the return message, but none came that I could hear. Everything was freakish. Ordinarily I can read 2AGJ longer than any other eastern station but on these particular nights, 2ABG was very QSA when I could not hear 2AGJ at all. Hope for better luck next time. It cannot be any worse. 73 8NH."

9ZN, Mr. Matthews, Trunk Line Manager at Chicago, writes as follows:—"Well, it seems that the weather was at fault. In ten years of amateur operating, I have never seen anything to equal it. 8NH evidently could not hear 2AGJ, and the latter could not hear the former. I could not hear either, or for that matter, any other 200 meter station. All Chicago stations agree with me in saying that it was just as if some one had pulled a non-conducting blanket around us, shutting us

off from the rest of the world. None of us heard one single 200 meter distant station during the last four nights.

As soon as things become normal, I can take the message direct from 8NH or 2AGJ or for that matter from you in Hartford. On the night of the relay, I was on the job as per orders, but I could not hear a single spark except WST, who was very weak. A heavy rain was falling accompanied by lightning, making reception an impossibility. Notwithstanding, I called 8NH, 2AGJ and 1ZM, attempting to find a hole, but unsuccessfully. The storm of Thursday seemed to leave the air through Illinois, Indiana and Ohio absolutely dead. We believe we will never meet similar weather if we run many relay tests. In proof of our confidence that we can get a message through to the coast and back in a few hours, we hereby invite our President, Mr. Maxim to start another relay using the same route. We will stake our reputations that it will go through successfully. 9ZN."

From Grand Forks, 9XN, we have heard nothing as yet.

From Lewiston, Mont., 7ZC, Mr. Arthur C. Campbell, we have the following:—

Very unfortunately the Transcontinental Relay has been a failure over the western end of the route. I therefore consider it my duty to make a full report.

On the night of Thursday, January 4th conditions were very bad indeed here.

On the night of Friday, January 5th, conditions were very good.

I did not receive the letter of instructions until the Wednesday before Thursday, the night of the relay. I immediately wired day letters to 9XN and 7ZH, arranging for practice on that night. We were able to communicate rather poorly with 9XN that night. We received him O. K., but apparently he received us rather poor. We heard nothing at all of 7ZH. On Thursday evening at 6:00 o'clock, we received a wire from 7ZH saying he had moved to another locally and his station was not working. It being too late then to inform headquarters, we decided to try to get the message, and make an attempt to get it to the coast if we received it. The night being a very poor one, we were unable to hear 9XN, and hardly any one else.

Friday, January 5th at noon, we received a wire from Mr. Mathews, saying the relay would be repeated and to be on the job. At 6:00 P. M., we received a wire from 7DJ, saying 7ZH was out of commission and to try working him or 7YS direct. A few minutes later another wire was received from Mr. Mathews instructing us to work 7YS direct. We then wired 7DJ that if the message was received here, we would make every effort to reach him enlisting the help if necessary of a limited commercial station.

We stayed tuned on 425 meters from 7:00 P. M. to midnight, and heard numerous stations over the country, including Denver, Salt Lake, and other distant amateurs, but not a sound from 9XN. I can hardly believe that he was on that night.

In November, our 100 ft. aerial masts blew down during a severe storm. As the weather was very severe, thirty six inches of snow having fallen, and temperatures ranging from ten above to thirty below we were unable to do anything toward putting up new masts until a few days ago when we raised some seventy ft. masts. Our location is very poor here, for long distance work, being completely surrounded by moutains.

As 9XN and 9YG on the east are six hundred miles distant and 7ZH on the west is four hundred and fifty miles distant, the coast being eight hundred miles distant, you can readily see what a handicap we have in relaying across the country. It is true, a year ago this winter, we were able to work over the route you had mapped out for the relay, with the exception that we worked thru 9YG instead of 9XN, but this winter so far we have never worked thru, and if I had known that you were going to attempt a relay across this route, I would have told you that it would be impossible to get across.

Early in September, when Mr. Mathews appointed stations across this route, I did my very best to get things working. I could not hear anything whatever of 7ZH, could not even get a letter from him. I ran tests with numerous other stations, including 7ZD, Bozeman, Mont., 100 miles

distant from here, trying to get them working, without any results whatever. I tried hard to find stations between here and 9XN or 9YG, that could be worked, without any results whatever. I therefore had to throw up my hands in disgust. It is true, there is some long distance communication in the west, but my observation has been, that it is only possible on exceptionally good nights, you might say freak nights, and there is no regularity to it whatever. Just why there are so many licensed stations thru this country and so few of them able to work any distance is more than I can tell you.

The Power Company I am working for has ordered two one hundred and twenty ft. masts for my station, and we expect to erect them in a far better location than we have now, but that will be some time next summer and will do us no good this season.

7ZH informed us in his wire that he had a tower under construction at his new location, and it hoped that we will have a route working across here in the sweet by and bye.

Sincerely regretting the failure of the transcontinental relay.

Yours Very Truly, A. C. CAMPBELL.

Wireless Censorship

Do you know why wireless stations were censored at the beginning of the War and cables were not? Here is an interesting piece from the New York Times which explains the situation:

The Executive order of the President, Aug. 5, 1914, prohibited radio stations from transmitting or receiving unneutral messages, and delegated to the Secretary of the Navy the enforcement of the order. The Sayville Wireless Station was taken over by the Navy Department July 8, 1915. In explaining why a distinction is made between the wireless telegraph and the submarine cables to Europe as regards the censorship of messages transmitted by those routes, the Department of State quotes the following extract from a letter addressed to the Hon. William J. Stone, Chairman, Committee on Foreign Relations, United States Senate, by the Secretary of State under date of Jan. 20, 1916, relative to the "Freedom of communication by submarine cables versus censored communication by wireless".

"The reason that wireless messages and cable messages require different treatment by a neutral Government is as follows:

"Communication by wireless cannot be interrupted by a belligerent. With a submarine cable it is otherwise. The possibility of cutting the cable exists, and if a belligerent possesses naval superiority the cable is cut, as was the German cable near the Azores by one of Germany's enemies, and as was the British cable near Fanning Island by a German naval force. Since a cable is subject to hostile attack, the responsibility falls upon the belligerent and not upon the neutral to prevent cable communication.

"A more important reason, however, at least from the point of view of a neutral Government, is that messages sent out from a wireless station in neutral territory may be received by belligerent warships on the high seas. If these messages, whether plain or in cipher, direct the movements of warships or convey to them information as to the location of an enemy's public or private vessels, the neutral territory becomes a base of naval operations, to permit which would be essentially unneutral.

"As a wireless message can be received by all stations and vessels within a given radius, every message in cipher, whatever its intended destination, must be censored; otherwise military information may be sent to warships off the coast of a neutral. It is manifest that a submarine cable is incapable of becoming a means of direct communication with a warship on the high seas. Hence its use cannot, as a rule, make neutral territory a base for the direction of naval operations."

Radio Communications by the Amateurs

COMMENT AND CRITICISM

The following refers to Dr. Radio's article in the December QST.—Editor.

In your December issue, I noticed that Dr. Radio in his excellent article on short wave transmitting gives the formula for the proper capacity of a transmitting condenser thus:

$$\text{Mfd.} = \frac{2^9 \cdot \quad \text{Kw.}}{V^2 \text{ spk. fq.}}$$

This should be:

$$\text{Mfd.} = \frac{2 \times 10^9 \text{ Kw.}}{V^2 \text{spk. fq.}}$$

This of course makes a vast difference.

In his last paragraph on Page No. 36, the "Dr." advises the amateur to "'reduce his inductance to give him sustained oscillations in his antenna." I don't see how he can reconcile this statement with the formula for decrement, viz:

$$\text{Decrement, d, } = \frac{w}{2} R \sqrt{\frac{C}{L}}$$

The author's statement about being able to estimate decrement with a lamp bulb in the aerial circuit also sounds remarkable to say the least. I am sorry that an article in other respects so good should be marred by such flagrant errors.

Let me assure you, in closing, that I can scarcely overestimate my appreciation of your wonderful magazine. I can hardly wait for it to come out each month. A Happy New Year to QST and may it enjoy even more well-deserved popularity!—Roy Griffith, Narberth, Pa.

DR. RADIO'S ANSWER.

Our Editor has turned over to me the very worthy criticism of Mr. Griffith of my article in the December QST. Regarding his first criticism, I must admit this is a typographical error. It was observed too late to make a correction.

In respect to the second suggestion, I wish to ask Mr. Griffith if he can reconcile my statement of reducing inductance to decrease dampening with the formula for the dampening of a single circuit which is given as follows:

$$D = \frac{R}{2n\ L}$$

D—Decrement
R—Resistance in ohms
L—Inductance in henries
n—Frequency.

By examining this equation, we can see that as L increases, the resistance which accompanies it, R, will also increase, but at a much slower rate. This means that if we make L large, D will become small. But on the other hand, looking back at the formula given by Mr. Griffith, making L large means that C will decrease to keep the wave length constant and it becomes a question of whether we wish to have a large condenser and a small inductance, or a small inductance and a large condenser. My statement was made purely from the experience which I have encountered and does not seem to agree with the formula given.

It is also true that a high dampening is often desirable in the primary circuit. If we could quench our spark out, after one complete oscillation, the results would probably be better than after four or five oscillations which are present in the average amateur set. I really believe a general view of my statement will be accepted. On the other hand, I admit that it does not seem to agree with the formula given.

The third criticism is a misinterpretation. What was meant was not that the lamp is located in the antenna circuit, but

rather that a wave meter containing a flashlight bulb, used as an indicator for the resonance point, was a rough estimate for determining the persistency of oscillation. That is, one gets a more accurate idea of how sharp his wave is by means of a lamp indication on the wave meter, than from a wave meter, with a detector and phone.

I should like to hear more from Mr. Griffith about the relation of inductance to dampening.—Dr. Radio.

*****

RELAY WORK

I am quite interested in relay work and wish to help the organization in whatever way I can. I am personally acquainted with Mr. C. L. Austin (KDP) and we are trying to get the amateurs in this section of the country to be more organized and have certain working nights in which to relay any message they may get. The stations in this part are not as numerous as in the East, and we have trouble in getting anything through, but if those that are here would have certain hours that one could depend on getting them, I would not have six or eight messages waiting to get through as I have now. 7YS, Lacy, Washington, said he would call me last Tuesday and Thursday night, but on account of QRM from numerous unlicensed amateur stations, I was unable to receive him or else he did not send. At any rate, the QRM was very bad.

I am now holding two messages to Seattle, two to Spokane, one to Lewiston, Idaho, and a couple of others, because I do not know who is or will be on the job. —P. W. Dann, Portland, Ore.

Editor's Note:—The trouble which Mr. Dann has experienced is not unlike that which so many of us have run across. QRM and uncertain hours seem to be the two worst enemies of our work. How are we going to correct them? Send in your point of view to the Editor.

*****

TO THE OLD MAN ON "ROTTEN QRM"

By Henry L. Leeb. 2CB

Having just finished reading your article in the January QST, I am taking the liberty of writing you to assure you that I thoroughly appreciate your views on "Rotten QRM".

Wherever you may be located and whatever may be the conditions of local interference in the vicinity of your station, I am morally certain that they are no worse than they are hereabouts.

It is now 9:30 P. M. About fifteen minutes ago, I put on my phones and was greeted with the following: JS JS JS K JS JS JS JS JS JS JS JS JS JS JS de de AB AB 3 AB AB AB AB AB AB AB AB AB (copied exactly) from a spark coil a few blocks away. Is there anything more disheartening? Whenever I want to do any work wth stations outside my district, I have to wait until midnight or after. Cannot something be done to alter this lamentable state of affairs? I have been doing my best to educate the mob in this vicinity and it is a formidable mob, but the battle is most one-sided when waged single handed as it has been in my case.

Could not something be done through QST to remedy this matter? Some such scheme as the following might be used: Enlist the services of some amateur of good standing and recognized ability in each locality where local interference is known to be bad. Have this amateur make a monthly report of the most flagrant offenders,—together with some of the more typical examples of the calls, sounds, noises, and other things that go to make up the average conversation of the small fry amateur who has no consideration for others. Have this list or report published each month in QST. A little advice and a few suggestions directing to the more troublesome offenders pointing out the error of their ways and requesting that it be made a matter of duty to them to stop it, and also to see that their co-offenders use a little more consideration. Such a report might be arranged for a number of localities and published each month. In my opinion, when the culprits realize that they were actually being kept track of and their crimes were being publicly advertised, they would assume more responsibility and we would have less QRM.

Can you suggest any other campaign which might be more effective? Some-

thing surely must be done in the near future and a man of your apparent ability and insight on amateur wireless would be a valuable leader of the campaign.

I should be very glad to have this matter brought to the attention of the Editors of QST for their opinions and suggestions. If, in your judgment, this letter or any portion of it would be of assistance in starting something, you may publish it in the next issue of QST.

I hope in the near future something can be definitely accomplished along the lines laid down in this letter. In the meantime, I beg your indulgence for thus unceremoniously intruding upon your affairs.

*****

ANOTHER QSA

Friends:

Enclosed you will please find a dollar for year's subscription to QST. I have only been with you for four issues, but they were enough to convince me that you were "there with both feet and some steam." I can say with emphasis that you are GREAT. You may be little, but oh! my!

I am especially interested in your relay lines as I would to displace a (?), on Trunk Line F. I am installing a 1 Kw. transmitter and will probably be able to cover considerable distance. I use a Roome oscil-audion for receiving and have heard 6BJ very loud. 6AAV and 6SI also come in very strong. When I get together, I will tell you just what distance I am good for.

Well, here's hoping that you get bigger (you can't get any better) and wishing you extended success.—Herbert G. Strain, Red Bluff, Cal.

*****

HEARD AT ABINGTON, PA.

The accompanying list of stations was heard at 3AFA from November 20th to December 1st:

1ZM, 1VN, 1ZL, 1UU, 1JZ, 1ASC, 1ABF, 2JU, 2PH, 2JD, 2CE, 2LK, 2OJ, 2AGJ, 2IB, 2IM, 2DA, 2ABG, 2QB, 2ALI, 2ZK, 2YM, 2SP, 2NZ, 2ZV, 2FH, 2AUG, 2CB, 3WN, 3ZW, 3RO, 3ATR, 8CL, 8AKF, 8ASG, 8AEZ, 8NH, 8CS, 8XA, 8LE, 8AEH, 8YO, 8PA, 8JA, 8CO, 8VX, 8AOF, 8PC, 8JY, 8YL, 8GA, 8OE, 8RS, 8OH, 8VP, 9VY, 9LR, 9WF, 9QL, 9ACM, 9OV, 9KY, 9WC, 9AEV, 9BA, 9GY, 9UH.—C. W. Weber.

COPIED AT ROCHESTER, PA.

1MD, 2ABG, 1AV, 1IZ, 1VN, 1RJ, 1ZS, 1GJ, 2IM, 2DA, 2LK, 2JD, 2ZH, 2ZI, 2PM, 2RL, 2CB, 2IB, 2AGJ, 2CX, 2ZE, 2JZ, 2ZV, 2BD, 2ZK, 2BM, 3QZ, 3XC, 4AA, 4AF, 4DI, 5ZU, 5BY, 5ZM, 5DU, 8NH, 8AEZ, 8CH, 8VX, 9VE, 9LR, 9EN, 9IK, 9GK, 9AN, 9RW, 9GY, 9VP, 9NU, 9HQ, 9GJ, 9EF, 9SP, 9ARB, 9PC, 9YO, 9XO, 9CF, 9SK, 9KG, 9XM, 9RC, 9ZL, 9BA, 9VY, 9LE, 9FT.

This is only a partial list. Most of the above I hear quite often. Some of these fellows are at distances in excess of 1,200 miles. A few deserve special mention. 2AGJ I have repeatedly heard from 25-30 feet from the phones. 5ZM I could read with phones on the table. 8AEZ often causes serious QRM as does also 2AGJ, —neither are very close. It seems impossible for me to copy steadily either 8NH or 8AEZ as they swing practically all the time at this station. While many others fade they do not come in as loud.

I employ an oscillating audion and three-step amplifier with excellent results. Have also heard over 1,000 miles several times.

LYON McCONDLESS,
8JX WARREN WOLF.

*****

CHAMPAIGN, ILL.

I am strongly in favor of the "Construction Department," started in the December issue. Also, I think it would be a good plan to emphasize the request that amateurs send cards to the distant stations they hear, because these things are very helpful to the fellow who is just starting up.

The following stations have been heard at 9WO prior to December 10th: 8JA, 8JZ, 8YA, 8SK, 8YO, 8YL, 8NH, 8AEZ, 9TR, 9HQ, 9HY, 9IC, 9RJ, 9LR, 9EP, 9GT, 9IK, 9BD, 9ABD, 9YO, 5BV, 5ZC, 5DU, 5ZM. My record sending distance this season was to 2AGJ.—Sherman S. Garrett.

WORTHY COMMENT

I am glad to see the work that the A. R. R. L. is accomplishing, especially in QST. I would not know what to do without QST for it brings us so much closer together. Publishing letters and pictures is another thing that appeals to me, showing me what some of the stations look like, especially those to whom we have talked.

Another thing you might mention is the fact that the majority of fellows are very indifferent about answering cards telling them that they have been heard. I could name fifteen or twenty fellows who are well known from Texas to New York, to whom I have sent cards but received no answer. I try to answer all mine as soon as possible, but getting several letters a day, it generally takes a day or two to answer them. It always helps to let a fellow know how far he can transmit and I think he appreciates it, but it gets a fellow peeved if he gets about five answers to twelve cards sent out.

Keep up the "How to Make Things Dept." as long as you have something as valuable as that in the last QST. It is a fine set. I believe that lots of fellows are neglecting their receiving set in trying to shove the juice into their aerial. There is one fellow here in K. C. who can send 300 or 400 miles and can't receive amateurs fifty miles away loud enough to read,—Guy E. Wilson, Kansas City, Mo.

*****

LET US STOP THIS SORT OF THING.

The following is an extract from a letter we have received from a station which is working hard and spending real money to improve relay work. We ought to all array ourselves against operators of this kind and make things so uncomfortable that they will either have to act like gentlemen, or else go out of amateur wireless.

"Let me tell you a few things about certain 'pests' in this city. On one Test Message night, as we were trying very hard to get a test message north on our Trunk Line ——, a 'ham' about half a mile from us happened to get a little peevish just because he wanted to work some 'L. D.' fellow, and we were on the same time with our test. He started in sending (reading a story book) and kept it up for about half an hour, when his hand was just about gone from cramps in his fingers, and then he says 'My hand is so crampy now that I will have to quit using it and sit on the key.' He did this, and it lasted about half an hour. All this was done with the secondary leads connected across the aerial and ground. (Broad wave). By the time he had finished his 'QRM,' it was too late to try anything else on relaying, so we had to quit.

Later on, another fellow did the same thing as the one just mentioned, and we had to give up again.

Last night another one of those fellows was working and making a lot of 'QRM,' so we told him to please 'QRT' and that it was our Test Night. He came back at us with, 'Say, who do you think you are any way; every time I want to work any 'L. D.' (long distance) you fellows have to come in and hog the air with your d—— test message. I will 'QRT' when I get good and ready, so don't tell me what to do".

So there you are. There is always one thing after another like that. I guess the League often wonders why we never have much success with our Trunk Lines. At present we are a little discouraged, but we WONT GIVE UP.

Is there anything the League or any one else could do to stop this interfering on relay work? If so, please advise."

We certainly hope to be able to do something very forcible in the near future. In the meantime, let us all join hands against such practice as those described whenever we can.

*****

WIRELESS DANCE

One of the first wireless dances was lately held in Morristown, N. J., at the home of Theodore E. Gaty. Mr. Gaty tuned his set up and by means of a regenerative system and a two-step amplifier attached to a loud speaking phone, he was able to amplify the music from the DeForest Factory at Highbridge, New York. The distance was about forty miles, yet the signals were so strong that six or seven couples were able to dance to it.

RADIOGRAM ENVELOPES.

Mr. J. O. Smith, of Valley Stream, N. Y., has sent us a sample of a special envelope printed and used by him for mailing messages going to New York City. This saves thirty-six hours in delivering them and furthermore gives the addressee information concerning the method of reply. The envelope has the words "American Radio Relay League—Radiogram" at the top, in large letters. At the bottom, the following information which applies to 2LK especially is given. "A reply to this message may be sent by mail to Station 2LK, Valley Stream, Long Island, N. Y. No charges for this service." This seems to us such an excellent idea. What do you think of it?

*****

RELAYING UNDER ORDINARY CONDITIONS.

The following information was received from Mr. J. O. Smith, of Valley Stream, N. Y. (2LK). It has proven to Government officials that it is possible for excellent relay work without any prearrangement to be carried on by the American Radio Relay League.

"On the night of December 15th, 8XA sent 2AGJ a message going to Admiral Benson, Navy Department, Washington, and I got it on the night of the 16th, and promptly got hold of 3ZW and gave it to him. He in turn gave it to NAA at 3:00 A. M., on the 17th. This was a real chance to prove our ability to people where is undoubtedly carried weight, and I think it certainly is to the credit of the American Radio Relay League to have handled the message so expeditiously. It bears out my contention that if unnecessary interference could be checked during certain hours at night, the good stations could handle any amount of traffic and get it through promptly."

J. O. SMITH, (2LK).

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ANSWER TO MR. EHRHARDT.

With regard to Mr. Roy C. Ehrhardt's answer to my query about phone trouble, I would like to suggest that if he desires to eliminate the trouble as completely as I have, he should disconnect from the ground pipes entirely. In place of this use a semi-inductive ground consisting of three to five copper wires buried about four inches under ground running parallel with his aerial if possible. Wires should not be smaller than No. 10, and about thirty or forty feet long. This will serve as a better ground than the pipes, and if a distance of from fifteen to thirty feet can be left between the wires and the pipes, it will eliminate the inductive effects almost entirely unless the aerial is at right angle to the phone line.

My query was to find out how to cut out the trouble **entirely.**

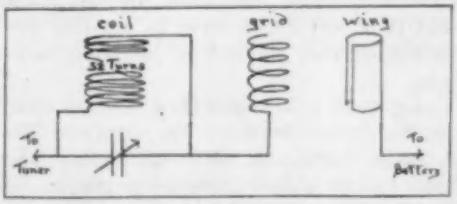
My next door neighbor is about thirty feet from my aerial and ground. His antenna is parallel to mine and he can listen in with very little trouble when I am sending.

Another thing would be for Mr. Ehrhardt to ask the Telephone Company to clear up the ground around the nearby line. This would cut down the noise about seventy-five percent.—E. E. House, Battle Creek, Mich.

*****

THIS MIGHT HELP YOU!

I am using an Audiontron bulb and have been quite successful tuning in stations from 1,000 to 15,000 meters. I have heard NAA seventy feet from the phones; NAR with the phones on the table and OUI in the afternoon. This was with a fifty-five foot aerial fifty-five feet high. I used an inductive ground and the Armstrong circuit. This is all very well, but, I could not tune in the amateurs and hold them. I was told to wind several turns of wire around the bulb and apply battery



thru a variable resistance. I tried this and found that it only paralysed the bulb. After trying several I found the hook-up

given herewith to increase the strength of amateurs and furthermore to hold them so that I had no difficulty in reading them easily. The signals were not only twice as loud, but I also heard many amateurs whom I had never heard before. This hook-up seems to decrease the high wave stations but the bulb oscillates very freely.

The turns on the bulb were wound in the same direction as the spiral grid inside. The wire is No. 29 S. C. C. There are fifty-two turns, shellaced, to hold them in place.

I hope that some other amateur will benefit by my experience and be as successful with the hook-up as I have been.

E. E. House, Battle Creek, Mich.

*****

COMPARATIVE TESTS.

Editors of QST.

Gentlemen:—

Not wishing to be left out of the general chorus, please allow me to express my approval of our excellent little publication, which is already the ONLY wireless magazine in the world.

I have an idea in mind which I would like to offer for what it is worth. Why wouldn't it be a good stunt for QST to make a sort of standardization test of the various places of amateur apparatus now on the market, and publish the results. Surely the different manufacturers would be willing to submit their products for such a test and it would be especially valuable in the line of phones, loose-couplers and detectors if one could know their comparative efficiencies. This would be an aid in selecting one make or another, bearing in mind of course, the price.

Now I have no intention of killing off our editors by overwork, but merely offer this as a suggestion and would like to hear what you think of it.

Extending to you all the season's greetings altho they are a little behind time, I am, yours respectfully,

Arno A. Kluge, Lincoln, Neb.

Mr. Kluge has been informed that we are now making tests of phones and hope to make comparison of other instruments in the near future.—Editor.

HOW DO YOU LIKE OUR QST, OM?

QST Publishing Co.

Dear Sirs:

Under separate cover I am sending you a two year renewal to QST. Your postscript on the letter you sent me, asking me what I thought of our QST, set me thinking. Herewith are what seem to me four good reasons why QST is better than any other wireless magazine I have ever taken.

1. QST is not run to advertise some company as are so many magazines today.

2. QST represents every amateur in the country. You Eastern fellows please imagine how you would feel if you were not represented by QST, and then you will know we feel about other magazines that do not give the West a look-in.

3. QST has the best articles on things that I have been waiting (it seems years) for other magazines to publish, but somehow they never got around to it. These articles are best, because they are simple, concise and entirely illuminating to the most ignorant "ham."

4. QST is doing more to establish a national relay league that is not a commercial proposition, than any one I know of. It has certainly covered the ground and lacks but a few details to perfect a system of trunk lines of which our Government should be proud.

We amateurs of the West are behind you and any time that you need a bigger spark with which to send out your QST, just let me know.

Hoping QST a lasting and continued success, I remain,

Norman M. Scofield, Sunnyvale, Cal.

*****

WORKING UNDER DIFFICULTIES.

Editor of QST,

Dear Sir,

I feel as tho I must work off a little of my enthusiasm by writing you a few lines. First I must compliment you on your magazine which certainly is the best thing on this Radio infested globe of ours. Please advise if you can furnish all back numbers from Number 1.

During the past summer I was touring

the Northern states with the Hagenbeck-Wallace Circus as calliope player. I have a very complete radio station installed in my wagon. It consisted of an Ultra-Audion and loose coupler. My ground consisted of a brass curtain rod stuck in the earth; my aerial, of one of the steel guy wires that held up the center poles. This was sixty feet high at one end and fifteen at the other and one hundred feet long. I was never without incoming signals and had no trouble with inductive noises or other electrical disturbances as we were on the edge of the towns. Many times I copied strong signals with an aerial of a hank of wire hung on a nail in the wagon and the water tank for a ground.

Now for my home station. I have an efficient Audion Regenerative set for short and long waves. I have a complete work shop and laboratory for making all my transformers, tuners, condensers, etc. I have a one K. W. Transformer, oil condenser, rotary, and oscillation transformer of my own design. Believe it or not, an oil condenser increases radiation twenty five percent by actual test. My station is located in a three story office building and my aerial is on the roof on fifteen foot poles, making it about eighty feet high. There is a direct current generator in the basement that furnishes juice for the building in day time so I an only "on" after 5:30 P. M. About this time the QRN from the light wires commences and continues until 12:30 or later which makes radio work nearly impossible but we are trying to locate the trouble and hope to succeed. The noise resembles more than anything else the scratching of the old time parlor matches on rough sandpaper. This occurs at intervals of about three seconds to a minute apart completely paralysing the audion.

I am also bothered with induction from a 1,500 volt mercury arc rectifier in the same block which energizes a string of series arcs.

There are several very enthusiatic operators here including myself having over four years experience in radio work. We can take thirty words easily. I am tickled to death with the relay game and when I get the local noise cured or move my station, I want to get lined up. I get Dallas, Waco, Temple and other Texas cities very easily. I copied 9MQ and 8YL last night very strong thru considerable static.

CUL Hoping QST the greatest of success, I remain,

Wesley Tilley, Austin, Texas.

*****

WHAT IS HIS TROUBLE?

Editor QST,
Dear Sir,

I am taking the liberty of asking you a question or two that have been sticking in my crop for some time. Either I am thick as a board or else something is wrong. If it is the latter, what please? I fail to get the extraordinary results that are sometimes read about in QST. My aerial is seventy-five feet long, made of copper No. 14, four wires, two feet apart. These are all connected at the far end. At the other end the first two are connected on each side but there is no connection between the second and third wires. From these there are two wires, same size and two feet apart that are seventy feet long. These terminate in my lead-ins which are of the same size wire only insulated and thirty feet long. My ground wire is fifteen feet long. All connections are perfect. The main part of my aerial is sixty five feet high. The main aerial is due north and south. The two other wires run East northeast to West southwest. I have a Navy type loose coupler which is said to tune to 6,000 meters. Three thousand is about the limit. A type "AA" Crystaloi detector, and any quantity of galena detectors—a stopping condenser—3,000 Ohm phones—and the usual amount of other junk.

When I read of someone in the State of Connecticut who has an inside aerial and who can hear time signals several feet from the phones, I wax envious. As for my outfit I can hear Wellfleet, Arlington, Cape May, Buffalo, New York, Philadelphia, Fire Island, Newport, Boston and New London but always with the phones over my ears. WCC my nearest neighbor is not heard as much as one inch from the phones. They come in loud enough for all uses, but what I would like to know is

whether my set is so far inferior to the average, am I without knowledge of operation, or last but not least, are our worthy brothers stretching a point or two to make it good "listening?"

Yours for future success,
E. A. Hilborn, Webster, Mass.

Mr. Hilborn enclosed the hook-up of his set. This upon examination was found to be correct.—Editor.

*****

IMPROVEMENT ON CABLE COMMUNICATION.

A discovery that promises a new era in cable communication was announced from the War department recently. The discovery was the result of experiments carried out by Lieut. Col. Geo. O. Squire. It will permit of the reception of Morse signals used over cables to be read by ear instead of visually by means of the flashes as it is now.

The visual recorder required the employment of very highly trained operators, but the new invention called the "Audion Cable Receiver" will bring the operation of oceanic cables into the class of land line and radio telegraphy. The apparatus is an adaption of the well known Tikker and a super-sensitive audion amplifier. Very favorable tests have been carried out on the cable from Sitka, Alaska to Seattle, Wash. This cable although only 1,086 miles in length has a K. R. equivalent to the Atlantic cables. The cables have to suspend operation during atmospheric disturbances and electrical storms bpt as the new device is estimated as twenty times as sensitive as the present apparatus, is is surmised that communication will be uninterrupted in the future.

*****

New Turney Parts

The Eugene T. Turney Company has developed a new slider contact. It is very neat and fills a long-felt want. Along with the slider, they have succeeded in making a new type of contact. The regenerative audion sets require a minimum capacity in the contacts. These new "taps" have very low capacity and can be used in many places where the old style of points would not fit.

ERRATUM.

The Lake Shore Radio Association of Jamestown, N. Y., wish us to state that the station 8KS mentioned as being heard by Mr. Maxim in the November issue is not located in Cincinnati, but in Jamestown, N. Y. This is the star station of their society.

Anyone hearing 9WU since November 1st will greatly oblige Jas. B. Holston, Nashville, Ill., by dropping a card to same.

A Versatile Outfit

The illustration herewith shows a station equipped for receiving long or short, damped and undamped stations. The sets are cabinet style and the one at the right of the picture is connected to a loud-speaking horn, part of which may be seen. The sending outfit is ¼ K. W. capacity and is enclosed in a glass front cabinet. Mr. W. C. Poole has heard foreign stations and has worked 2AGJ at Albany, N. Y. This good looking set is located at Yonkers and is officially known as 2WT.

An Efficient 1-2 K. W. Station---3SZ

This illustration shows an efficient ½ K. W. which "looks like business." With a Packard transformer, Murdock condensers, home-made rotary and oscillation transformer, this station radiates 2.6 amps using a fairly large coupling. It is located at Portsmouth, Va., and has been heard at 8NH, 9VY, 2ZH, 2EX, 9CF, 2AGJ, 4DI, 3JL, 1VN, and 2ABG.

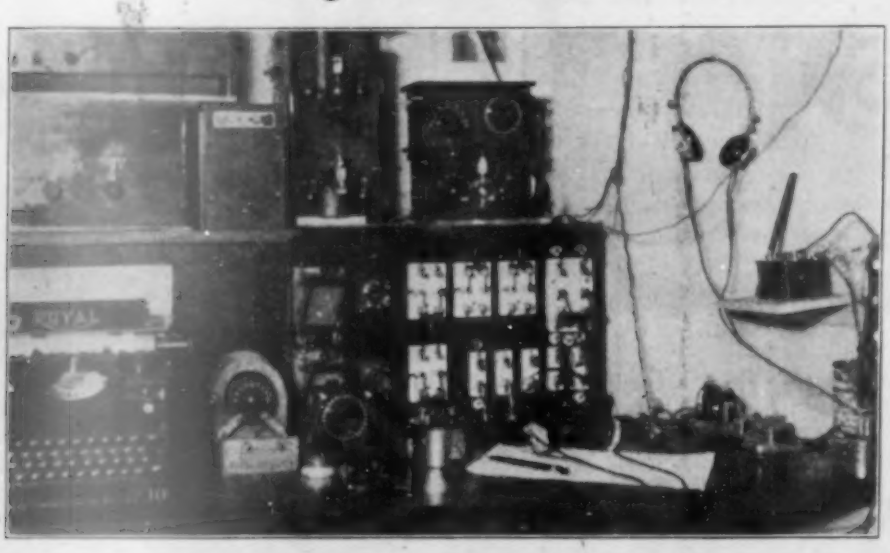
The receiving set is a combination mineral and audion outfit, with home-made loose-coupler.

The aerial clears the surrounding buildings and is 85 and 65 feet high and 85 feet long. Mr. L. C. Herndon complains of very bad QRM from the Hampton Roads fleet.

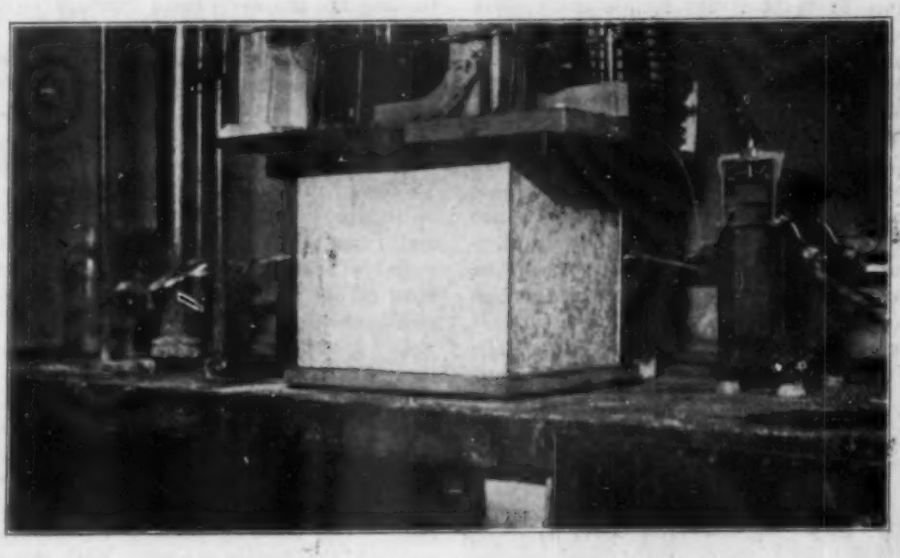
Geo. S. Cook's Outfit at Minneapolis, Minn.

These two illustrations show George S. Cook's outfit which is located in Minneapolis, Minn. The set consists of a one Kw. Jefferson transformer, 3-8 inch glass plate condenser in oil, oscillation transformer and Murdock rotary gap. The receiving consists of an Audiotron bulb. Navy type coupler, and the W. Ross McKnight circuit which has been described in QST. OUI has been copied at night as well as WSL, NAA, NBA, NAJ, NAR, and many amateur stations.

Long Distance Station



We are very glad to have the opportunity to show our readers two illustrations of the set 9PC, operated by Geo. Carter on the High School at Fort Wayne, Ind. 9PC is one of the best and most widely heard stations in the Middle West. It has been heard a great deal in the Atlantic states and as far south and west. They have an excellent aerial which is on fairly high poles on the top of the three story High School building. The illustrations are self-explanatory.



Station 8ACD
Lansing, Michigan

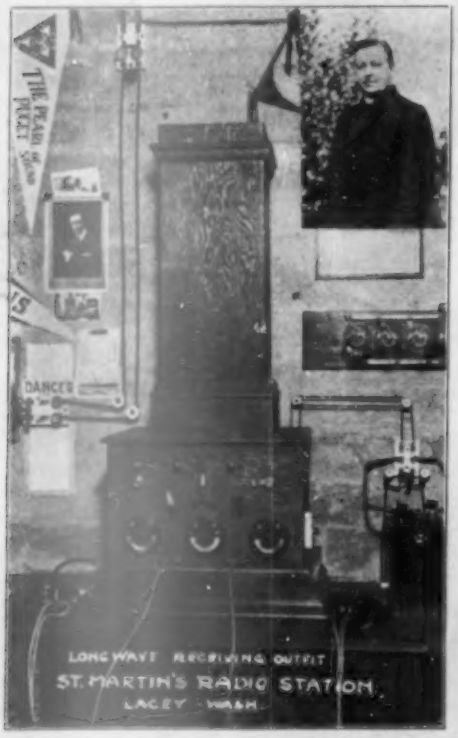
8ACD otherwise know as Mr. Roy Palmer is familiar to amateurs in the middle west. All apparatus is shown clearly in the picture, which therefore needs no explanation We know Mr. Palmer has found those short high voltage lads a great help. Many may benefit by following his compact arrangement.

A Long Wave Undamped Receiving Outfit

Rev. Sebastian Ruth.

Rev. Sebastian Ruth, Professor of Physics at the St. Martins College, Lacey Washington, presents a very simple and unique long wave loose-coupler. This is quite appropriate and will be appreciated by many who have found loading coils inefficient and unsatisfactory.—Editor.

With this outfit described below, I heard Hanover, Germany shortly after I had completed the hook-up and have been able to copy the station every afternoon since then at about three o'clock. The simplicity of the outfit makes it valuable to the amateur. My whole loose coupler which however is not loose in this case, is built up on a 7½ inch tube five feet long. The



tube was obtained at a carpet store where one can easily get ideal tubes for such work, ranging from four to seven and a half inches i ndiameter. Half of the tube is wound with 3,000 feet of No. 30 D. C. C. wire with nineteen taps taken from it leading to the left hand contact switch shown on panel.

This is the secondary. The primary winding begins half an inch from the secondary and consists of two thousand feet of No. 25 D. C. C. wire. Nineteen leads are taken from this part of the coil also. The large tube containing the primary and secondary is placed in a vertical position and runs thru the table. I use a small variable across the secondary and large ones across the phones and primary altho small ones would serve the purpose as well. I have a small fixed condenser in the grid curcuit. The push-button plate lights or extinguishes the filament. The double throw switch changes the hook-up from arc to spark stations. The other two switches on either side of the bulb control the high voltage batteries within the cabinet. The hook-up used with undamped waves is the Austin circuit. With this set I use a long single wire almost a half mile in length, suspended from thirty foot poles and running directly west from my station. Almost similar results have been obtained on a shorter "T" aerial. Besides OUI, I have also heard the new Japanese station at Funabashi near Tokio, Japan. The call is JJC and is best heard on the undamped hook-up at about five thousand meters. KIE—Hawaii, and KET—Bolinas, Cal. are heard working together on the same wave length. My southern range is NBA, Darien, Panama. Northward it is Ketchikan.

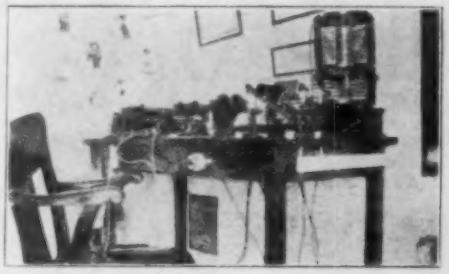
I believe that I am further from Germany than any other amateur in the country operating an undamped receiving set and thus have covered quite a long distance in receiving. As well as I can calculate, the distance from Lacey, Washington to Hanover, Germany is 6,400 miles. I have not yet heard POZ, Nauen, but expect to shortly.

I would be pleased to communicate with amateurs in the country who wish to build a set like mine and am willing to help them in any way possible. Several ama-

teurs in the seventh district have already begun sets while others have completed theirs and are now getting wonderful results.

Philadelphia--3WY

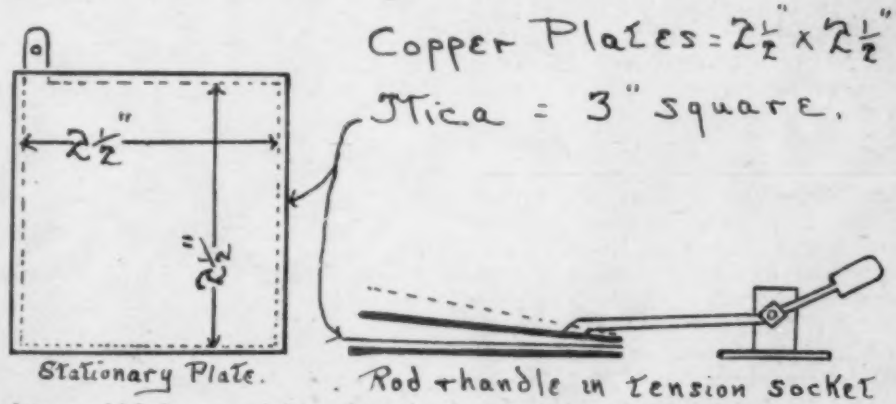
The accompanying photo shows the station owned and operated by Robert F. Basford. The receiver is of the usual regenerative type and has picked up 1IZ, 1EB, 2LK, 2AGJ, 2OJ, 2JD, 3PY, 3RB, 3CA, 3FR, 3AFA, 3ZS, 3ATR, 3WN, 8IA, 8AEZ, 8NH, 8JA. The sending unit is a



half K. W. outfit. Mr. Basford has assembled a very neat equipment.

A COMPACT VARIABLE--By E. E. House

In these times when half a dozen variables are used in every hook-up, home-made condensers have been experimented on by many amateurs. They have been found difficult to manufacture successfully on account of the accuracy necessary in aligning the various plates, and other troubles which made it more economical to purchase them in the first place. The following diagrams and explanation show a variable condenser which in my opinion solves the question. It is quite small and yet has a large capacity proportional to the space it occupies.



The condenser consists of two copper plates, one movable and one stationary. The stationary plate has on one side of it a sheet of very thin mica. The variation is on the hinge principle, but the movement seldom is more than one-half to three-quarters of an inch. The size of the plates is optional, and the other data is open to experiment, but the sizes given below have been correct for any ordinary use of the variable.

This variable has been used successfully in many places in different audion circuits, and as it may be made from the collection in any amateurs "utility box" is convenient to experiment on.

The very fact that it takes so little room to operate will make this type popular with the amateurs to whom the regulation variable has proven a "sticker" to incorporate in a cabinet set.

The diagrams make further explanation unnecessary.

FOR SALE & EXCHANGE

FOR SALE—One and one-half inch Murdock spark coil, "S" grade, audion bulb, both filaments good; Murdock $7.00 loose coupler; step-down transformer justment for 1 to 5, 5 to 10, 10 to 15, and 15 to 20 volt variations; 3 sections of Clapp-Eastham condenser, just right for a ¼ Kw. "Blitzen" transformer. Also a savage auto .22 for sale.

WANTED—Navy loose coupler, Audio Tron or Electron relay bulbs; amplifier coil. Write, H. B. Tyler, Highland St., Milton, Mass.

FOR SALE—Loose coupler, 18" long, first-class condition (Arnold's make), $8.00. Two unmounted Cambridge condensers, .001 M. F. brass plates, $3.00. Two inch spark coil, United Coil Company make, $5.00. Lightning switch 100 amp., 250 volts, $1.00 All sizes of loading coils from $1.00 to $5.00, from 10" to 3 feet long, 5" diameter. Also wave meter coils at reasonable prices. Arthur F. Loub, 445 E. 88th St., New York, N. Y.

EXCHANGE—One 75 ohm single pole telephone receiver, one moving picture lantern, one Erector set, No. 1, with all parts and a transmitter mouth piece with an eight volt miniature base electric light. All for a 1,000 ohm receiver and head band, with or without cord. All letters answered. Paul Jeffries, 2005 Artic Ave., Atlantic City, N. J.

FOR SALE—Station 8JA. Complete generating set (See Jan. 1916 QST). Complete station (See July 1916 QST). With aerial 50' high. 1ZL, 2AGJ, 3NB, 4AA, 5ZC, 9XN, have been worked repeatedly. Station up-to-date in every respect. Make an offer. Guarantee everything perfect shape. Reason for selling—Going away to school. Ross Gunn, 369 W. Lorain St., Oberlin, Ohio.

FOR SALE—Multi-Audi-Fone, price $16. one Radioson detector, $3.50; One Peroxide of Lead detector, $.90; one Electro, No. 8,487, loading coil $1.90. Will exchange loading coil for a variable condenser. J. R. Smith, Box No. 431, Osborne, Kans.

FOR SALE—One No. A-529 Duck's commercial type O. T. Cost $15.00, will sell for $8.25. First order takes it. Is new. Also one type AA Crystaloi with Turney buzzer, for $3.75. Perfect condition. Fixed condenser, cost $.70 will sell for $.35; Murdock 43 plate variable, good working condition, $2.75 takes it. Melvin C. Lapp, Plymouth, Wis.

FOR SALE—Set of three inductance coils for receiving undamped waves, $11. Reason for selling—I have not enough time to work with them. Also have some variable condensers. Want burned out round audion bulbs. Sherman S. Garrett, 9WO, Champaign, Ill.

WANTED—One Kw. old type Thordarson transformer. Must be in perfect condition. Will pay cash or exchange ¾ Kw. Thordarson as $15.00 part payment. Address L. A. Benson, 4156 Shaw Ave., St. Louis, Mo.

WANTED—A one Kw. wireless transformer (Thordarson perferred). Must be in perfect condition. Will pay cash or trade wireless instruments.

FOR SALE—A one-half Kw. Packard mounted wireless transformer. Guaran-

teed to be in perfect condition. Write, Carl Menzer, Lone Tree, Ia.

FOR SALE—One pair of Murdock No. 55, 2,000 ohm phones, $3.00; E. I. Co., 3,000 meter loose coupler, $6.00; E. I. Co. ½ Kw. open core transformer, $5.25; Blitzen Electrolytic Interrupter with brass rod-wire, $1.85. All goods three months old and in A1 condition. Am enlarging set. All letters answered. Samuel J. Grossman, 247 West 139th St., New York, N. Y.

WANTED—Thordarson transformer, Murdock condenser units, rotary gap or motor for one, and kick-back preventer. Have several instruments to trade, or will pay cash. No home-made stuff wanted. Instruments must be in A1 condition. Write, giving lowest terms. Darrell Minkler, 9 Mistletoe, St., Medford, Ore.

FOR SALE—Wireless receiving set, complete, modern and compact; also guaranteed. Write for details; all letters answered. Emerson Koch, 3032 E. Michigan St., Indianauolis, Ind.

FOR SALE—A one Kw. open core Marconi transformer, 110 volts to 30,000 at 60 cycles—Guaranteed to be in perfect condition. Reason for selling, installing more power. A bargain at present copper prices. First check $30. takes it. Transportation paid. Address all letters—Charles S. Ballantine, 4802 Germantown Ave., Philadelphia, Pa.

FOR SALE OR EXCHANGE—Two Audio Tron potentiometer "B" battery units, $.35 a piece; 38 plate Turney variable in exchange for a metal case Blitzen variable. Also have other apparatus and would like to have quotations on an E. I. fixed condenser, hot-wire meter, 0 to 5 to 10 amps.; Multi-Audi-Fone or audion, etc. Cedric E. Hart, 718 Sixth Ave., Salt Lake City, Utah.

EXCHANGE—A Master vibrator in a fibre case. It has a switch which you may use both battery and magneto. The vibrator on it may be adjustable by a screw. It is just the thing to vibrate your coil (wireless or automobile). Will

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FOR SALE—One-half Kw. Blitzen transformer, $6.00; Arlington receiving transformer, $6.00; 1½ Bunnell spark coil, $4.00; one spark gap, $.50; step-down transformer, $4.00 Henry Roehrich, 2 Belmont Ave., Garfield, N. J.

FOR SALE—One-half inch spark coil, $2.75 ohm receiver and headband, $.50; galena detector, $.50; two small motors, cost $2.00 each, sell $1.00 each; telephone bell ringer, $1.25; nickel registering bank, $.65; steps, sell $3.00. All above guaranteed first-class condition. Want enameled magnet wire, Brandes or Murdock phones, hard rubber, fiber, or bakelite panels, or what have you? Address Martin Knox, Granite Falls, Minn.

Bunnell coil with extra large coin con-

FOR SALE OR EXCHANGE—One 3" tacts, in good condition! guaranteed. $10.00 cash. WANT! One E. I. Co's., 1,000 ohm single pole receiver; good double headband, double cords; Baby knife switches or parts of brass switch points, 6-32 and 8-32 screws, rod strip, etc.; pieces Bakelite, hard rubber sheeting and tubing (large or small) in exchange for following: New 2A Brownie developing tank $1.00; one slightly used Knapp leader motor, $1.50; hack saw frame and blade, $.35; bicycle package carrier, $.50; all new Alger books and four Boy Scout books, $.10 each. All articles in exchange must be in good condition; mine are. Names of the books on application. Correspondence answered. Write! Donald Baumgardner (ACT) Demster, N. Y.

FOR SALE OR EXCHANGE—Two new Murdock variable condensers, No. 366; one Multi-Audi-Fone in fine condition; one new DeForest bulb, very sensitive, never been used. All letters answered. D. R. Simmons, 3134 Lillian St., Shreveport, La.

FOR SALE OR EXCHANGE—8ZP—Formerly 8SK—**FOR SALE COMPLETE.** This station(with a transmitting record of 1,300 miles must be disposed of at once. Everything from antenna to ground. All apparatus up-to-date and the very best. Modern transmitter, with open core transformer, air condensers, and enclosed gap of novel type. Regenerative audion receivers in genuine mahogany cabinets. Solenoid operated antenna switch, which makes it unneccessary to bring high tension leads into the operating room, and still dispense with an anchor gap. All switches, panels, Electrose antenna insulators, and accessories. Recommend this outfit the man looking for a complete set that will give satisfaction from the start, and will guarantee a radiation of five amperes at least with the transmitter. Send stamp for photos and detailed specifications. W. D. Woodcock, 496 West Ferry St., Buffalo, N. Y.

FOR SALE—Type S audion bulb, double filament, unused; goose neck fixture for audion, n. p; 6 binding posts, heavy, n, p; battery switches, heavy, n. p. Sent postpaid for first $4.75. Chas. C. Henry, Loras Hall, Dubuque, Ia.

FOR SALE OR EXCHANGE—RJ5 Audion in fine condition with batteries and a new bulb, never used; will trade for pair Brandes Navy phones and two Audio Tron bulbs, both must be in good condition. Also Murdock loader, cost $3.50, trade for good rotary variable condenser of about ten plates. Write quick, all answered. C. A. Mathiasen, Onawa, Ia.

FOR SALE—Enclosed sending and receiving set. Range, Key West receiving, 20-40 miles sending. Table, 3'x3' x2½'; loose coupler, condenser, galena detector; high tone buzzer, etc. Receiving $10. Sending: 3 inch coil with electroytic interrupter; spark gap; helix with pilot lamp; key, two condensers, switch; etc. Sending $10. Both $18. Send stamp for photo. E. A. Mahannah, 261 Sommer St., N. Tonawanda, N. Y.

FOR SALE OR EXCHANGE—One Murdock's oscillation transformer, No. 424, $3.00. (Cost $4.00); one Radio apparatus Company rotary gap, model GK-1, $9.00. (Cost $12.10); four sections of Murdock's moulded condenser, together with rack, $9.00. (Cost $13.00). The articles used only three months and are in A1 condition. I want Radio Apparatus Company's Navy coupler and variables. What have you? J. Felix Currie, 606 Huntington Ave., Houston, Tex.

FOR SALE—Three six volt rheostats in good condition and a receiver; also other second hand wireless instruments. Address R. Cookman, Clyde, N. Y.

EXCHANGE—¼ H. P. direct current, compound wound, motor or generator, Robbins & Myers make. Delivers 110 volts at 2½ amps., for ½ Kw. closed core transformer. Also have Goodell Pratt amateur bench lathe. Exchange for wireless apparatus. Need 600 volt, 100 amp. ground switch. S. P. Fister, Northumberland, Pa.

FOR SALE OR EXCHANGE—¼ inch spark coil, potentiometer, voltometer, Morse 20 ohm instrument, 3 inch bell pedometer spark gaps, silk, cotton and enamel magneto. Wire, bare wire, tinfoil, in exchange for tuning coils, one inch to three inch spark coils, variables and loose couplers. What do you want or what have you? Write for prices on what you want. All goods in perfect condition. Don Ringo, R. R. No. 3, Paris, Ill.

FOR SALE—One receiving transformer, De Luxe, cost $25., will sell for $15; 3,000 meter two-slide tuner, cost $4.00, will sell at $2.00 One sending set consisting of one two inch spark coil, sells at $5.00; one spark gap, sell at $.50; one condenser, sells at $1.00; one telegraph key, sells at $.75; one helix, $4.00. Complete sending set for $9.00. Reason for selling—am going away to Military School. C. F. Woese, 802 McBride St., Syracuse, N. Y.

FOR SALE—One 6½ x8½ plate view camera, tripod, carrying case, plate holder, one dozen Hammer plates, three gross 5x7 paper, ten 5x7 Gray mounts, 5x7 printing frame; one 11x11 trimming board, Brownie No. 2 folding camera, Brownie No. 00 camera 5x5 trimming board, 4x5 print frame, dark room lamp, Hypo, developers, graduate tank. Any offer for parts accepted. Alvin R. Leavitt, 13 Grant St., Natick, Mass.

FOR SALE—One pint Leyden jar, slide variable, 2½ lbs. antenna wire, transformer core for ½ Kw. Flexible, ½ Kw. transformer, step-down transformer, one inch spark coil parts. I would like an RJ9 DeForest audion with or without bulb. Alvin R. Leavitt, 13 Grant St., Natick, Mass.

FOR SALE OR EXCHANGE—Three slide tuner, Murdock and Brandes headsets, detectors, condensers, spark coil, ½ Kw. Curtis high potential transformer, helix, Weston Duplex meter, I. E. Co's. AC ammeter, switches, cameras, and supplies. Want ½ Kw. Packard or Thordarson rotary gap, key, etc. Audio Tron bulbs, receiving transformers or what have you? R. G. Devanny, 4624 Winthrop St., Pittsburgh, Pa.

trade for Brandes Superior receivers with head-band. Glyn Prather, Clifton, Tex.

FOR EXCHANGE—Home-made 7,500 meter loose coupler, $2.00; home-made 400 meter loose coupler, $.57; Tmco detector, $1.75; Albany .003 mf. variable $2.00; Murdock loading coil, $2.25; buzzer, $.15, DPST slate base 60A, 250 v, $.25. Will sell for above price or exchange for five 15,000 m. loading coil, Brandes phones or Audio Tron. C. W. Gibbs, 52 Linden St., Rochester, N. Y.

A Wave Meter Contest

MORE than one promising Radio Club wants a wave meter, but due to lack of money, it has never been bought. QST comes forward to create an opportunity for these Clubs. We will furnish the wave meter, if you will return a little vigorous work. The scheme is this:—We will give the wave meter shown in the illustration to the first Club which comes forward with one hundred paid yearly subscriptions to QST. As an extra reward, we will give a pair of first class head phones to the member of the Club who gets the greatest number of subscriptions for his Club.

This gives everyone a chance. Start in right now. The first Club which gets one hundred subscriptions gets the wave meter. Every other Club which also gets one hundred subscriptions during the two weeks following the first award, also gets a similar wave meter. Everyone has an equal chance, not only to earn for their Club a wave meter, but also to get for himself a pair of good phones.

There are no complicated conditions. Nothing but a little "Pep" is necessary. Get in the game today. Your Club wants one. It's the best wave meter we can find.

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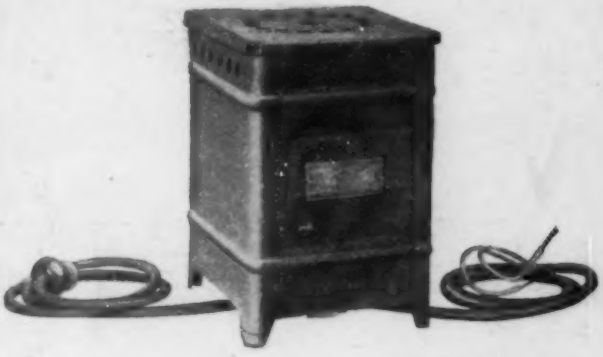

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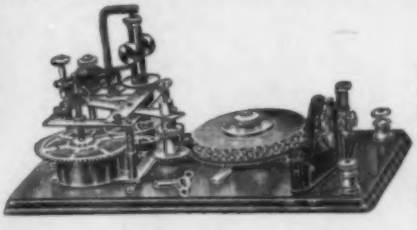

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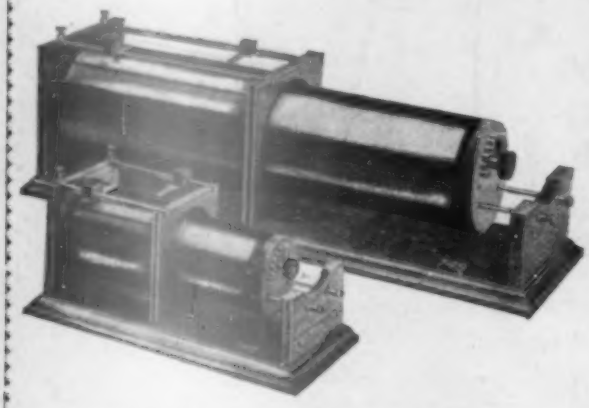
New Undamped Wave Coupler, No. 749

Special Introductory Price, $18.00



Our new Coupler No. 749 is 32 in. long, 9 in. wide and 10 in. high over all, and on the average sized antenna tunes up to 15,000 meters. This Coupler, used with the new CHAMBERS' SYSTEM OR CIRCUIT will bring in signals from domestic and foreign Arc Stations surprisingly loud and clear. Note the difference in size of our No. 748 and the new No. 749.

We claim to be the original inventors of a SYSTEM or CIRCUIT, for the reception of the undamped waves without the use of Loading Coils or Oscillating Coils, as they are sometimes called; as with our system or circuit only two inductively coupled coils are necessary. Circuit supplied with each coupler.

This CHAMBERS' CIRCUIT saves you money. Think of it! No extra coils to pay for, and price of coupler only $18.00.

Place order now so as to be in on the introductory price. Orders filled in rotation. Send for descriptive matter.

F. B. CHAMBERS & CO.

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Announcing the DeForest Tubular Audion Bulb

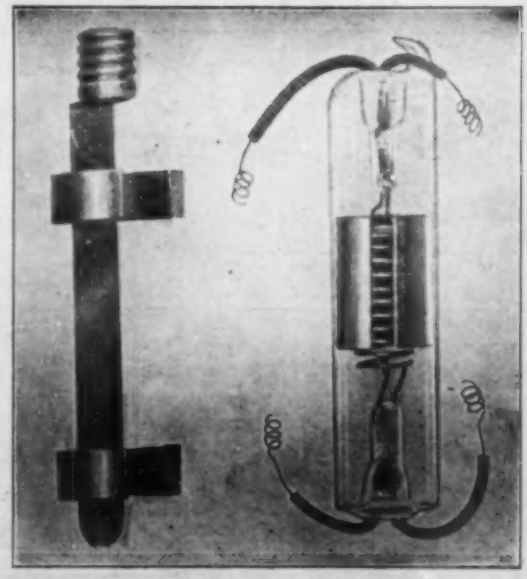
"There is only one Audion-the De Forest"

The New Type T Tubular Audion Bulb gives very loud signals from powerful stations. It has a large cylindrical plate, a spiral grid and only one filament of tungsten. As this is a long straight-line filament, it has a long life. Edison effects are completely eliminated. The plate is in contact with the heavy glass tube, preventing overheating.

Sold Separately, $5.50 each

The special adapter fits this type to the screw base receptacles of De Forest apparatus, and is furnished at 40 cents extra.

Send stamp for Bulletins D16 and B16



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EVERY FEATURE article that appears in the magazine is prepared from the data obtained in the actual construction and operation of the apparatus described. For every article, a model is constructed in the EVERYDAY MECHANICS EXPERIMENT STATION, 101 Fifth Ave., New York, where it is given a practical working test. This means accurate and dependable data for you experimenters. THE NEW AUDION SERIES of articles on the use of the Audion for damped and undamped wave reception, undamped transmission, Oscillion telephones has information which YOU want. The series is written by M. B. Sleeper, whose experience in the DeForest laboratory makes the data unquestionably accurate.

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The new DeForest Ultraudion Detector enables every operator to receive both spark and arc signals at minimum expense. This instrument is made for private or amateur use only, and is within the means of all. Heretofore the lowest priced genuine Ultraudion cost $110.00.

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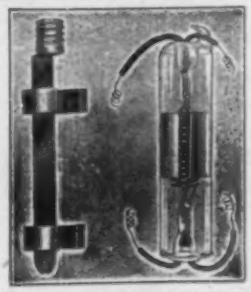

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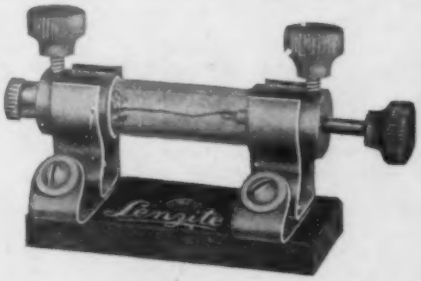

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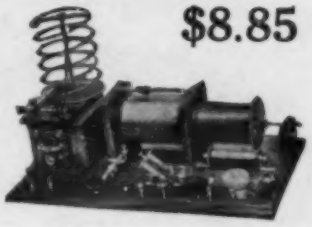

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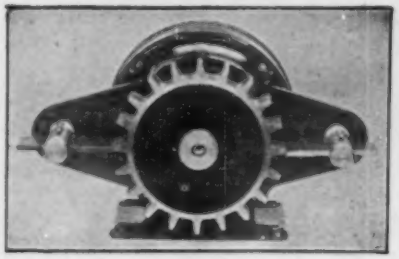

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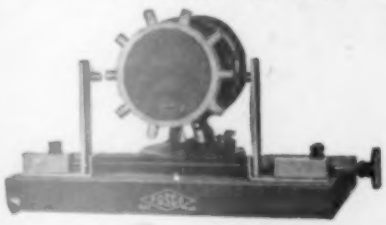

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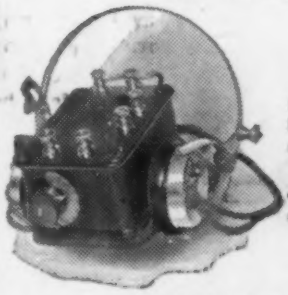

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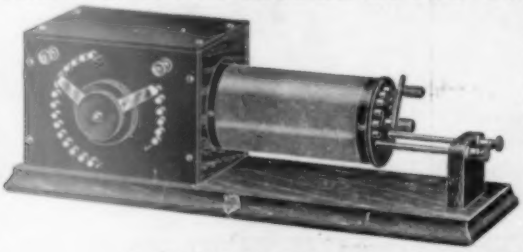

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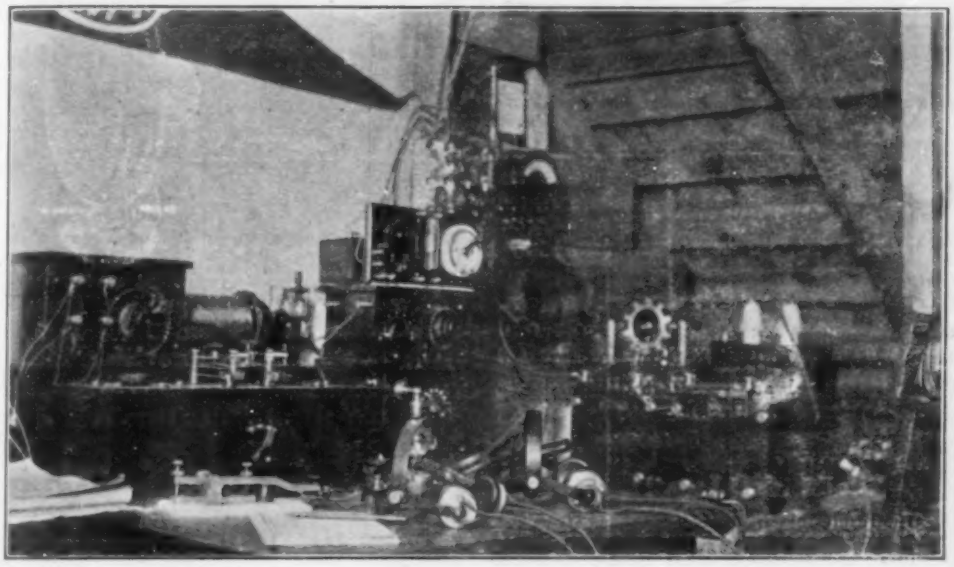

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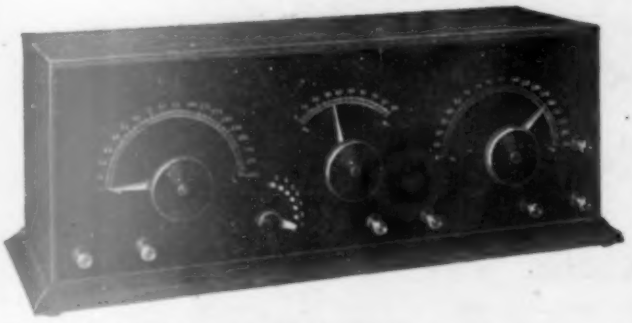

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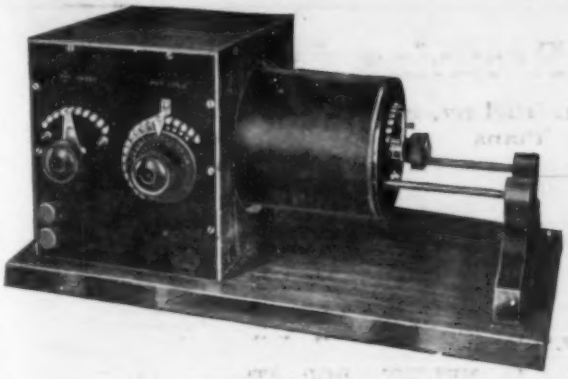

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